Grinding & Finishing

The Magazine Devoted Exclusively to Abrasive Operations

THE LIBRARY OF CONGRESS
SERIAL RECORD
APR 5 - 1956
NE COPY SENT TO

★ FEATURES

The New Flex Wheels

Gage Lapping Requires Skill and Patience

Are You Getting Your Money's Worth From Your Abrasive Cut-off Wheels?

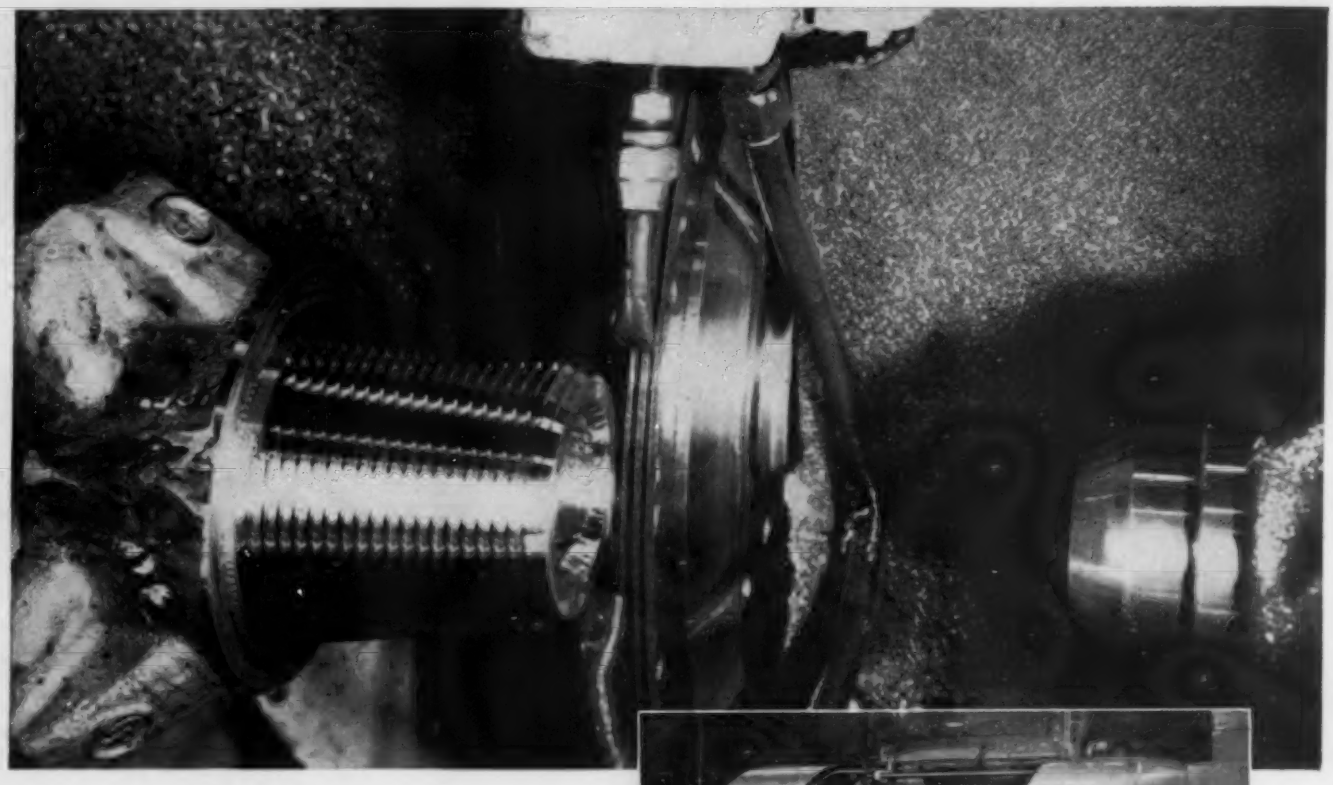
Centerless Grinding

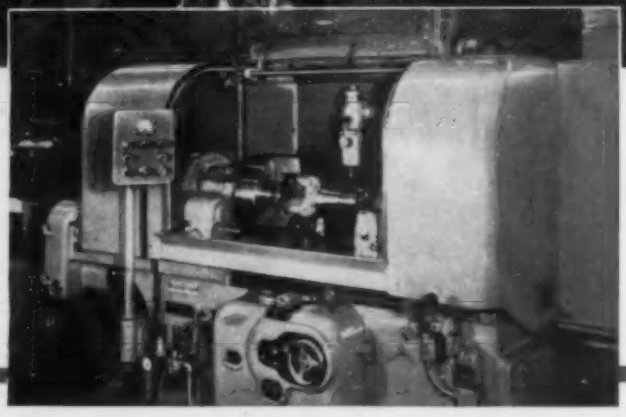
ALSO IN THIS ISSUE

Shop Hints and Kinks
Safety
Letters to the Editor
Free Literature

WHEELS • GRINDING • HONING • LAPPING MACHINES • ACCESSORIES • PORTABLE GRINDERS • TUMBLING • ABRASIVES

MARCH 1956





JOB DATA

Machine: Jones & Lamson Thread Grinder
Part: Rock Bit
Thread: 4½ API, 5 threads per inch
Steel: 4620
Wheel: Multi-rib Diamond Dress—24" dia. (new)
Speed: 1910 rpm (max.)

Accurate threads... fine wheel performance... low costs

TEXACO GRINDTEX OIL 411 is used exclusively for this one-pass thread grinding job at the Fort Worth plant of Chicago Pneumatic Tool Company. After more than four years' experience with *Texaco Grindtex Oil 411*, the company reports: (1) excellent wheel performance; (2) highly accurate thread form; (3) fine finish; (4) long oil life; and (5) low operating cost.

Texaco Grindtex Oil 411 is especially suitable for grinding hardened steels where accuracy and fine finish are required and difficulties with surface discoloration and burning must be overcome.

Whether your grinding requires a straight oil or an emulsion, Texaco has one exactly right to produce the results you want: longer wheel life, greater accuracy, better finish and lower cost.

There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do *all* your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you select the proper ones.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, New York.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Encircle No. 312 on postpaid card

MAR 26 1956 B 584255

MARCH, 1956 — VOL. 1, NO. 11

Grinding and Finishing

Contents

Editor's Page 23

FEATURED ARTICLES

New Flex Wheels 24
by Jack Kenyon, Associate Editor
Are You Getting Your Money's Worth From Your Abrasive Cut-Off Wheels? 28
Gage Lapping Requires Skill and Patience 45
by John D. Minton
Centerless Grinding: Last of a 5-Part Series 51
Disc Grinding Speeds Finishing Operations 58
by Hank Rohrer
Brushing Set-Ups Speed Production 71
by Richard C. Bush, Assistant Editor
Common Errors and Corrections in Grinding Operations 75
SAFETY: Grinding Safely 83
by Edmund Mottershead

SHOP HINTS AND SHORT CUTS

Method for Grinding a Small Lot of Hardened Steel Rings 61
Magnetic Chuck Set-Ups Made Easier 62
Precision Bevel Gear Grinding Chuck 63
Prevent Damage to Centers 63

DEPARTMENTS

Letters to the Editor 15
Available Literature 85
What's New in Equipment and Materials 91
News of the Industry 113

EDITORIAL STAFF

William F. Schleicher, vice president and editorial director; *Jack Kenyon*, associate editor; *Ronnie Burritt*, consulting technical editor; *Richard C. Bush*, assistant editor; *L. Catherine LeCompt*, readers' service.

BUSINESS STAFF

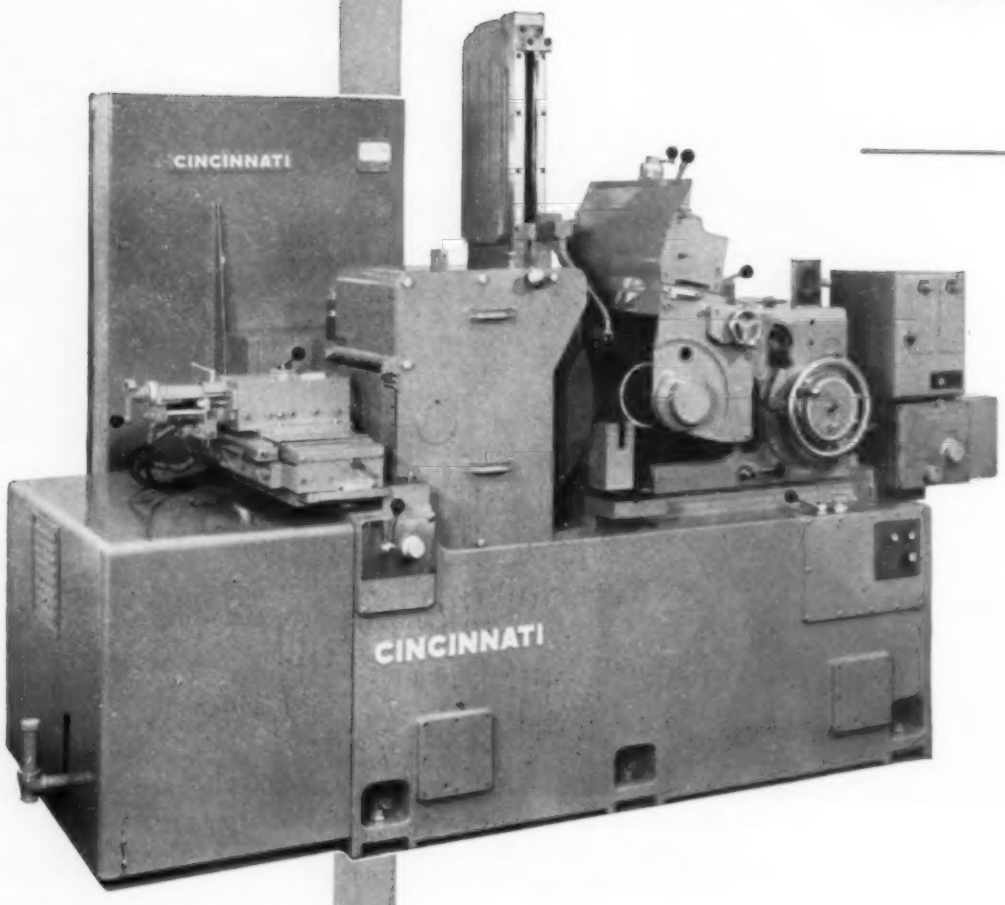
R. C. Van Kampen, president; *Vincent C. Hogren*, executive vice president; *J. E. Hitchcock*, vice president; *Oliver S. Pepper*, business manager; *John S. Todd*, production manager; *L. M. Schroeder*, art director; *Robert L. Spreckels*, circulation manager.

List of Hitchcock Representatives on Page 48.

Copyright by Hitchcock Publishing Co., 1956, 222 East Willow Ave., Wheaton, Ill. Phone WHeaton 8-3400. Cable Address: HITCHPUB.

Accepted as controlled circulation publication at Pontiac, Illinois

For the



NEW
CINCINNATI FILMATIC No. 3 CENTERLESS GRINDING MACHINE
with high production equipment for infeed grinding

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

NEW CENTERLESS on your list..

Check These Cincinnati Advantages

1 FILMATIC Grinding Wheel Spindle Bearings . . . eliminate bearing maintenance . . . self-adjusting for rate of metal removal.

2 Pre-Loaded, Precision Ball Bearing Ways under Regulating Wheel Slide . . . virtually eliminates "stick-slip" . . . assures positive sizing adjustment in the smallest increments.

3 Power Operated Profile Grinding Wheel Truing Unit . . . with rapid traverse and truing rates in both directions.

4 Infinitely Variable Regulating Wheel Drive . . . any speed from 10 to 320 rpm quickly and easily selected at operator's normal working position . . . positive braking action.

5 21 types of cost-reducing attachments and extra equipment, including automatic grinding wheel balancing.

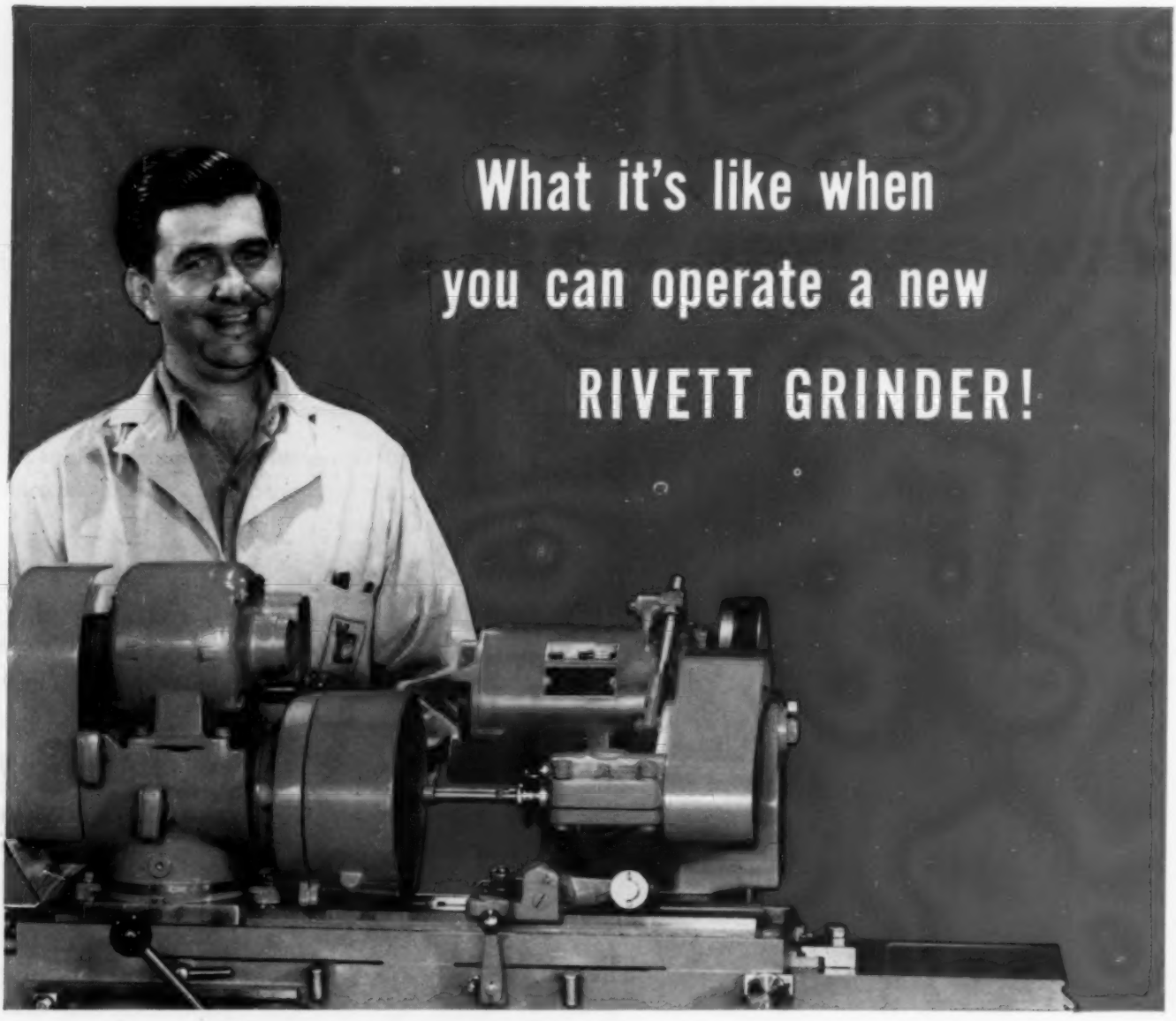
. . . all included in the NEW

Cincinnati Filmatic No. 3 Centerless Grinding Machine. Of course, there are many other new features and advantages that you will want to know more about, such as: stabilized infeed screw for preventing localized wear; positive lubrication of regulating wheel spindle bearings; controlled warm-up of bed casting, to maintain uniform work size as machine temperature increases. Catalog No. G-664 contains complete information. Write for a copy.

CINCI NATI

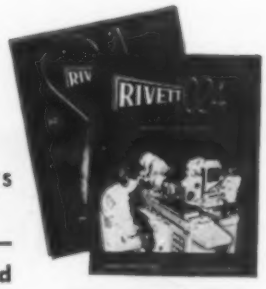
CINCINNATI GRINDERS INCORPORATED • CINCINNATI 9, OHIO

Encircle No. 201 on postpaid card



a big smile for operators — a big smile for management because both benefit by —

1. Greater output **2.** Closer tolerances

3. Reduced set-up time **4.** Minimum rejects

Get proof of greater productivity with Rivett Internal Grinders

Write for Catalogs and prices today— showing Model 84 with 3" capacity and Model 1024 with 9" capacity

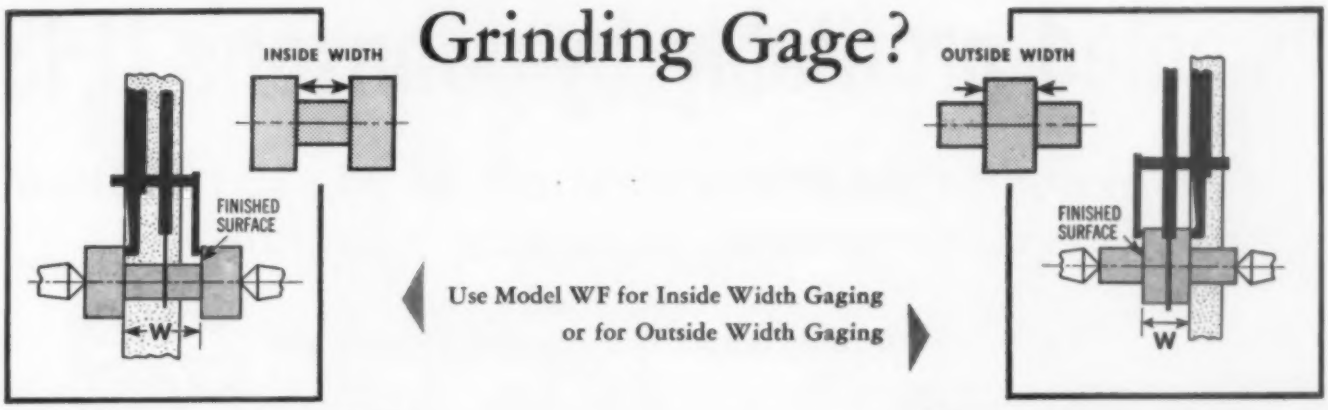
A symbol of accuracy in machine Tools.

RIVETT

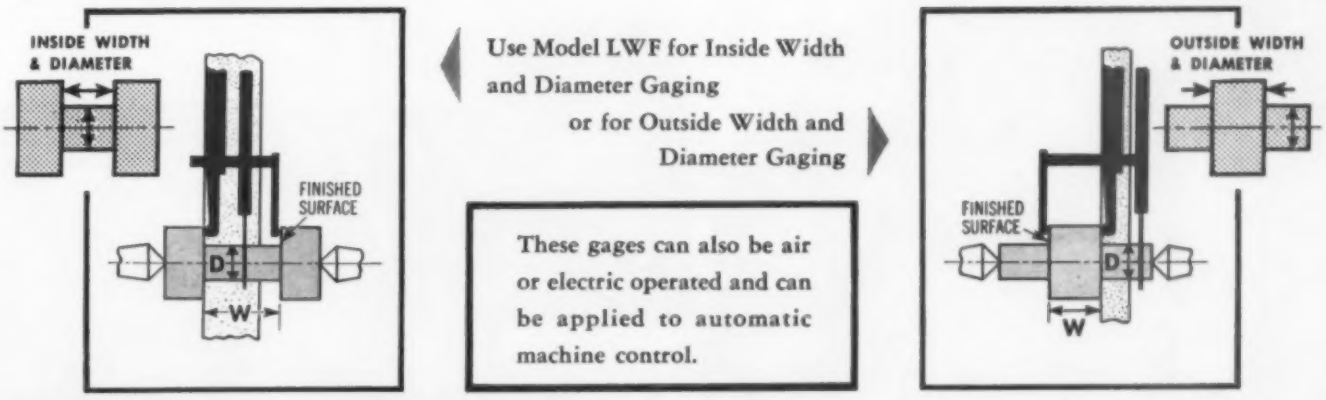
LATHE & GRINDER, INC.
Dept. GF3, Brighton 35, Boston, Mass.

Encircle No. 202 on postpaid card

Do you know you can do *these jobs, too* with the Federal Arnold Continuous Grinding Gage?

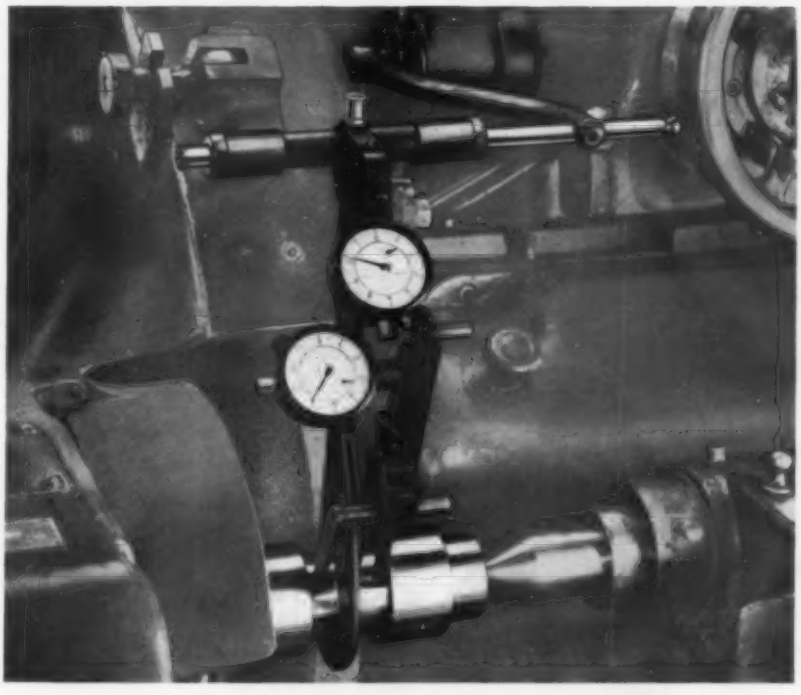


Use Model WF for Inside Width Gaging or for Outside Width Gaging



Use Model LWF for Inside Width and Diameter Gaging or for Outside Width and Diameter Gaging

These gages can also be air or electric operated and can be applied to automatic machine control.



The Arnold Grinding Gage is so frequently used to control the *diameter* of work on external grinders, its ability to gage a variety of other dimensions is often overlooked. You may be surprised to know that Federal Arnold Gages are regularly gaging *both inside and outside widths as well as diameters and simultaneously!*

Federal Arnold Grinding Gages assure maximum output per machine-hour, with *definitely less scrap,* less fatigue per man-hour — and better assembly, better performance and better production *at less cost per piece.* Catalog 55A shows other possibilities.

Federal Products Corporation
6443 Eddy St., Providence 1, R. I.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

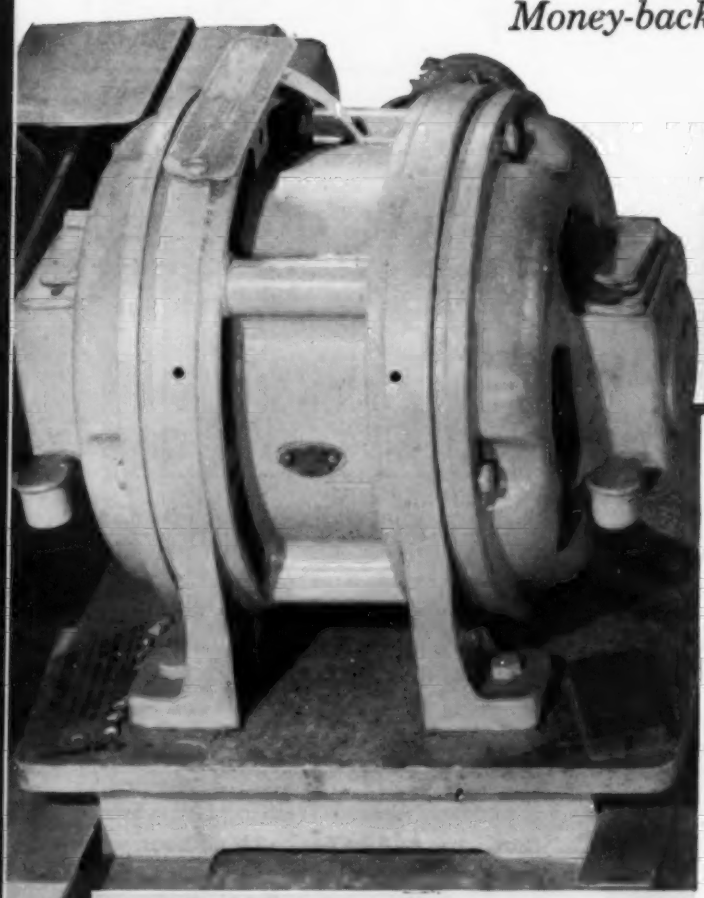
Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

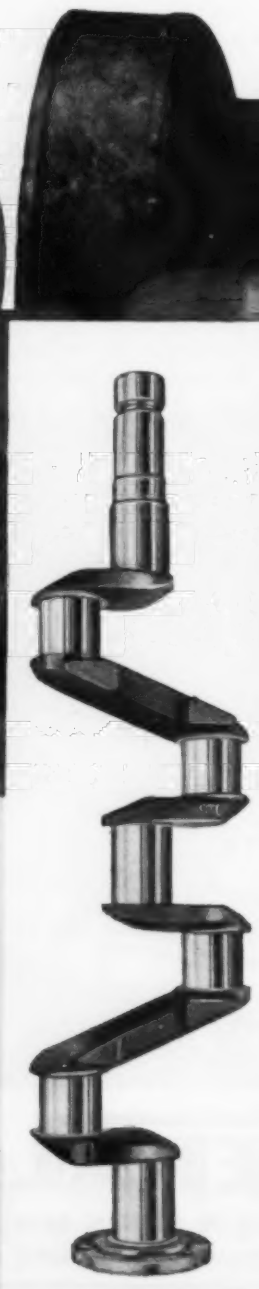
Encircle No. 203 on postpaid card

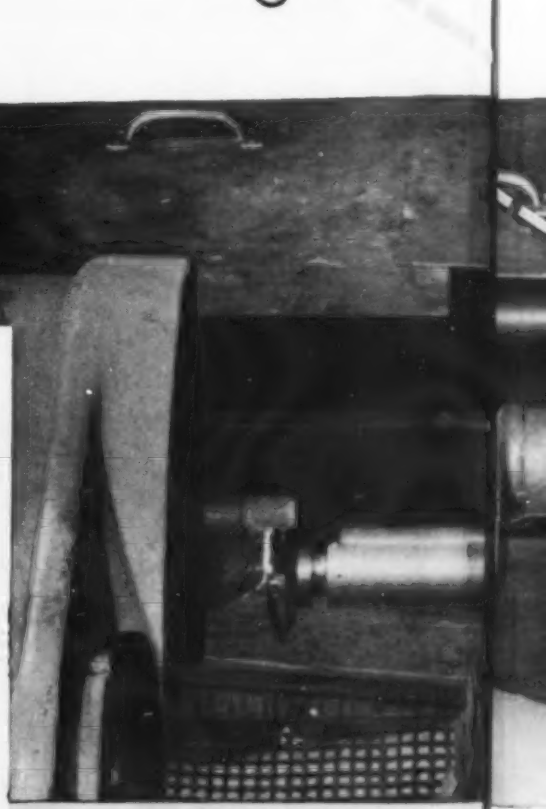
"Hot" challenge of shoulder grinding handled profitably by Johnson's TL-131

Unexcelled heat dissipation of TL-131 makes two-way dimensional accuracy possible

Money-back Guarantee of Performance







PROBLEM: To grind the crankshaft journal radius to close tolerance while simultaneously "side wheeling" the flat shoulder.

SOLUTION: Use Johnson's TL-131 water-soluble coolant to dissipate costly heat.

TL-131, and other Johnson's Coolants, contain heat controlling ingredients not found in conventional coolants . . . and heat dissipation is the key to cost control. That is the reason so many shops are switching to Johnson's Coolants and Cutting Fluids. They help you prolong tool life, reduce down time, obtain better finishes and increase production. *They are guaranteed.*

PRODUCTS OF JOHNSON'S WAX

S. C. JOHNSON & SON, INC.
Industrial Products Division
Department 36, Racine, Wisconsin

Guarantee of Performance

WAX-CUT WAX-COOL TL-131

There is no risk in trying any of Johnson's Wax Cutting Fluids. The full purchase price will be refunded if any of the above products fail to meet the following conditions in your plant, in actual production:

1. Provide increased tool life.
2. Provide greater production where increased feeds and speeds can be employed.
3. Gain operator preference.

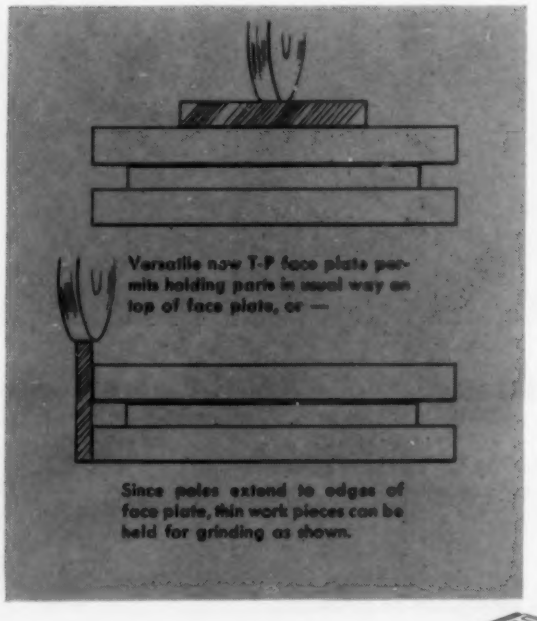
These three guaranteed advantages definitely increase the possibility of extra profits for your shop.

Johnson's Wax-Cutting Fluids are carried in stock by a leading industrial distributor in your area. Your local Johnson's Wax Industrial Distributor will be happy to arrange a trial in your shop.

For the name of the Johnson's Wax Distributor in your community, call Western Union by number and ask for

"Operator 25"

New Face Plate on Taft-Peirce Permanent Magnet Chucks


Versatile new T-P face plate permits holding parts in usual way on top of face plate, or —
Since poles extend to edges of face plate, thin work pieces can be held for grinding as shown.

Increases Capacity Simplifies Setups

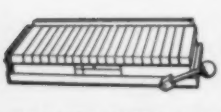
Now lower, longer, and stronger T-P Superpower Permanent Magnet Chucks offer you more surface plate area to work with. Poles extend to edges of face plate to eliminate waste space and dead spots.

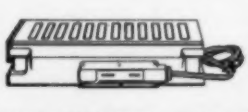
15 to 20% lower in height than other Permanent Magnet Chucks, these Superpower Chucks give you more clearance between wheel and chuck.

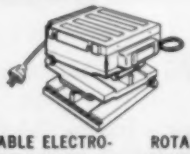
Since poles extend the full width of face plate, sides of chuck can be used for grinding edges of thin sections. Simplifies complicated setups.

In addition, a Superpower P-M Chuck has more magnetic poles for its size — gives you a greater effective working length.

Extra-sturdy construction assures maximum dependability, minimum maintenance. Now available in a range of standard sizes. Also in sine angle chuck models. Specials on request. Write for more information.


PERMANENT MAGNET CHUCKS


RECTANGULAR ELECTRO-MAGNETIC CHUCKS


ADJUSTABLE ELECTRO-MAGNETIC CHUCKS

ROTARY ELECTRO-MAGNETIC CHUCKS

T-P means Top Precision T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

Encircle No. 205 on postpaid card

BESLY Grinderscope

News and Views About Ways to Cut Costs with Machines and Methods from Besly-Welles Corporation, So. Beloit, Illinois

At G. E.'s Appliance Park . . . Besly Grinders Hold Tolerances to 10,000ths

A few miles out of Louisville, Kentucky, are a plant and operation that truly merit the word "fabulous".

This is General Electric's Appliance Park. Here, integrated into one vast operation, are manufacturing facilities for all of General Electric's major appliances . . . ranges, water heaters, refrigerators, freezers, automatic washers and dryers, room air conditioners and all the other items in this famous line.

At Appliance Park, the largest manufacturing plant in the Louisville area, are 5 buildings—100 acres, more than 4,000,000 square feet of floor space under roof. So huge is this plant that conveying and handling alone require 45 miles of conveyors. Here 12,000 employees earn their living and work under the most advanced conditions.

Helping General Electric's people to turn out better products more economically is one of the greatest arrays of high-efficiency production equipment ever installed in any plant.

At Besly-Welles, we are proud to be included in this line-up with Besly Disc Grinders. Day after day these grinders are turning out parts to tolerance standards that in some cases actually approach zero deviation. And they are doing it at speeds to meet production needs—with minimum maintenance.

PLEASE SEE THE NEXT TWO PAGES for just what Besly Grinders are doing at Appliance Park and how they are doing it.

BESLY Grinderscope

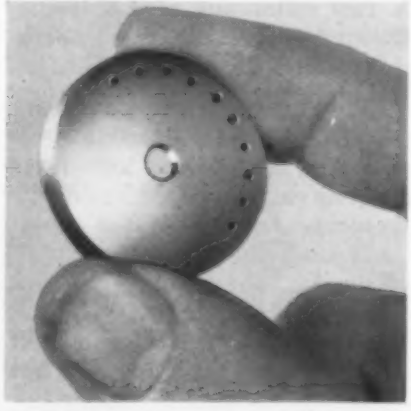
News and Views About Ways to Cut Costs with Machines and Methods from Besly-Welles Corporation, So. Beloit, Illinois.

Grinding Hardened Valve Discs to Split-Hair Tolerances Takes Some Doing...

But This Besly Double Horizontal Spindle Grinder Does the Job in One Pass – 950 Parts per Hour

These valve discs, small but vital to a refrigerator, demand an accuracy far greater than the normal requirement for mechanical parts. For example, tolerances must be held to plus .00015" and minus .0000", with a stock removal of .004"! At the same time, production rates of 950 pieces per hour have to be maintained to keep production rolling. All this on valve discs that have been previously hardened to Rockwell 60C. The valve discs pass through the Besly No. 226 only once—both sides are ground to specifications—all in less than 4 seconds per piece.

Doing this high-precision job is a Besly No. 226 Double Spindle Wet Grinder, equipped with two 23" abrasive discs and a power-driven rotary feed unit. This rotary feed offers highest performance with parts of medium to small size, when high production is a factor. It lends itself to automatic loading and unloading, as the continuously rotating disc, with suitable openings, holds and carries the work between the Besly-Titan abrasive discs. Usually only one dressing of the discs is required per 8-hour shift.



This valve disc is ground to precision specifications—both sides in a single pass—on the Besly 226 Grinder in less than 4 seconds.

BESLY Grinderscope

News and Views About Ways to Cut Costs with Machines and Methods from Besly-Welles Corporation, So. Beloit, Illinois.

The Besly 226 used at Appliance Park with such satisfactory results is *not* a new machine. It was brought from General Electric's Erie, Pa., plant at the time when the appliance manufacture was consolidated into the Appliance Park operation. It had then been in service for about five years. The only adjustments required were minor repairs on the grinding spindles.

Because of the exclusive Besly Sealed Spindle Quill construction with its neoprene rubber diaphragm, foreign matter cannot enter. This, of course, is a prime factor in the long life of the unit under hard service. The in-built accuracy of the machine lasts.

The net performance results of the Besly 226 are perhaps best summed up by General Electric's planning engineer at Appliance Park: "The grinding of valve discs is an extremely close tolerance operation. The Besly Grinder has performed far beyond our highest expectations on this job."

IF YOU WOULD LIKE FURTHER INFORMATION JUST SEND COUPON ON THE BACK PAGE FOR BULLETIN NO. 200 ON DOUBLE HORIZONTAL DISC GRINDERS

How Other Besly Grinders Cut Costs at Appliance Park

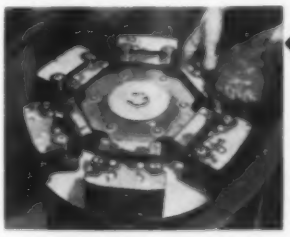
The Besly 226 is just one of several Besly Grinders that are helping to keep costs down and tolerances tight at Appliance Park—all at production speeds.

For example, there are the Besly-Bowen Grinders shown in the following pictures. These remarkable machines hold close tolerances consistently yet require little supervision beyond loading and unloading. Because they are two table grinders, with radial head, the operator loads or unloads and cleans one table, while the grinder does its job at the other. A simple cam control provides uniform stock removal on each table through each machine cycle.

There is practically no time lost for man or machine, yet operator fatigue is far less than for ordinary grinders.

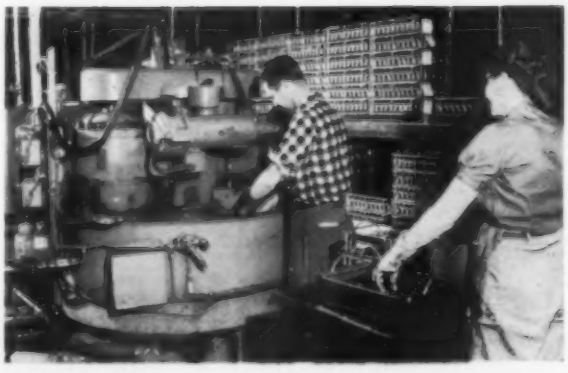
Besly-Bowen Grinders have opened up a whole new concept of automatic grinding to extreme tolerances. While simple in principle and operating technique, the basics of this revolution in high-speed grinding are worth your serious study.

PLEASE SEND COUPON ON NEXT PAGE FOR BULLETIN NO. 700

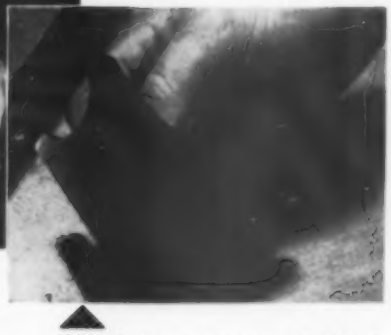


Positioning compressor pistons for finish grinding in a Besly-Bowen 707 Grinder, while grinding takes place on the second table. 400 pieces per hour are ground, with a stock removal of .010" in one pass. Tolerances are held uniformly to .001" for size and .0005" for flatness. No dressing of the 12" wheel is needed.

These Besly-Bowen 711 Grinders are finish grinding steel compressor cylinder brackets. Both are Model 711's, equipped with 18" abrasive wheels. Picture shows how grinding takes place on one table, while the other table is unloaded (grinder at right).



Parts are removed, ready for gaging, without interfering with the automatic cycling of the Besly-Bowen Grinder. As one table is unloaded, grinding takes place at the other.



This steel compressor bracket is ground in a single pass on the Besly-Bowen 711 Grinder to a flatness tolerance within .001".

BESLY Grinderscope

NEWS AND VIEWS ABOUT WAYS TO CUT COSTS WITH MACHINES AND METHODS
FROM BESLY-WELLES CORPORATION, SO. BELOIT, ILLINOIS

BESLY TITAN

OPEN STRUCTURE

Give Freer Cutting – Plus Long Life and Very Low-Cost Grinding

Besly-Titan abrasive discs and wheels are made either plain or perforated. In the perforated type, the size of the perforations may be varied, depending on the particular part being ground. Often, the perforations are omitted from part of the disc to take care of individual conditions.

It is customary to make a disc or wheel freer cutting by permitting greater space between the grains thru applying less pressure in the molding operation or the use of less backup of finer grains.

Still another factor has been introduced that aids in improving the cutting qualities (often with longer life) than is possible thru perforations or less density in molding. In this we add a material into the grinding member that is completely dissipated in the baking, leaving voids or clearance spots. These openings may vary from the size of a pinpoint to that of a pea. They may be very numerous throughout the mass or spaced quite far apart.

This open structure may be incorporated in a disc that is plain otherwise, or it may be in combination with small or larger perforations. In other words, that part of the disc not perforated, may still have very free cutting qualities, due to the extra openings between the perforations.

The result—A long lived, free cutting, extremely economical grinding member! Besly-Titan Steelbacs and Wheels are always made to order for your particular requirements, hence, when making up the formula, we can give you any feature or combination that will help you get best possible results.

Ask to have a Besly-Titan Abrasives Engineer call on your grinding department to see if one or another of these Besly-Titan Wheels or Discs can raise your grinding performance and cut your costs.

NEW BULLETINS

Here are the latest facts about Besly-Titan Abrasives and new Besly Grinders. Send coupon for free copies.

BESLY-WELLES CORPORATION
188 Dearborn Ave., So. Beloit, Illinois

Please send following free bulletins

- ☐ New Abrasives Catalog
- ☐ Bulletin 200 on Besly Double Horizontal Spindle Disc Grinders
- ☐ Bulletin 700 on Besly-Bowen Grinders

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

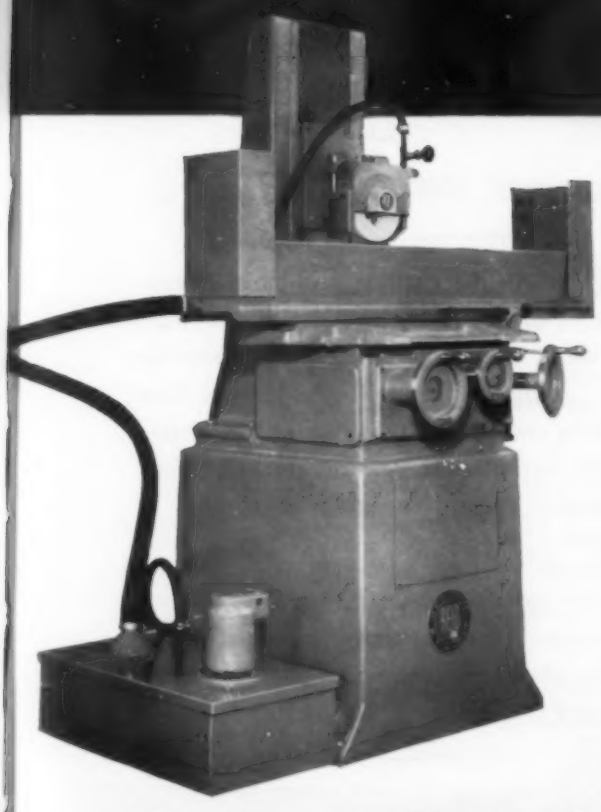
BESLY TITAN

ABRASIVES

SOLID DISCS • PERFORATED DISCS
CYLINDERS • WHEELS

Encircle No. 206 on postpaid card

REID sets the standard for precision surface grinding...



MODEL 618H convenient finger-tip level controls for all operations make this grinder the favorite of the toolroom for the finest tool and die grinding. Accessories, including Cool-Grind or wet grinding attachments, magnetic chucks and form dressers give extreme versatility for all operations.

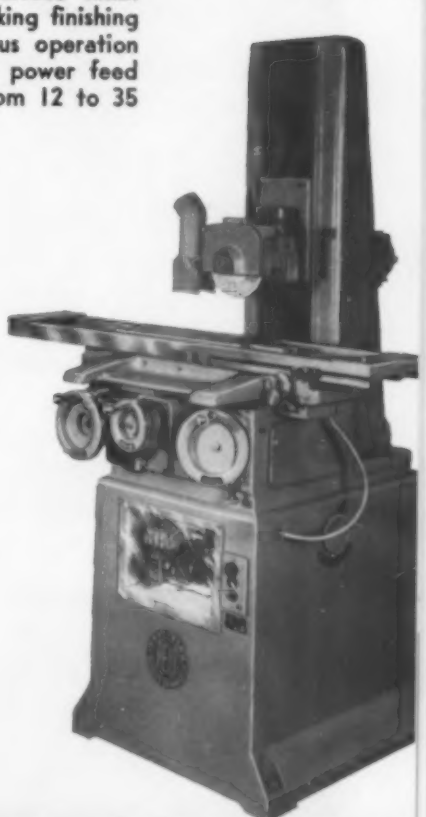
MODEL 618VL designed for precision grinding to the finest tolerances with superior surface finish . . . rugged construction and painstaking finishing give true dependability for continuous operation with minimum maintenance. Features power feed table with traverse speed variable from 12 to 35 feet per minute.

SPECIFICATIONS

CAPACITY: 6" wide, 18" long, 17¼" high from spindle center to table.
WORKTABLE: 51" x 8" overall.
FEED RANGE: Elevating hand wheel (r.) graduated to .0005" (optional, vernier to .0001"); cross feed to .001"; power cross feed adjustable .006" to .100" at either or both ends of table reverse.
GRINDING HEAD: with 3" opening for standard 1 h.p. cartridge type motorized spindle. Wheel size: 7" x ½" x 1¼".
FLOOR SPACE: 71" x 43½"
WEIGHT: 2100 lbs. net

Write for Bulletin 618-18

Photo courtesy Robertson Mfg.



Reid Brothers Company, Inc.

BEVERLY MASSACHUSETTS

Electro
TRADE-MARK
SINCE 1919

SNAGGING WHEELS

Increasingly Superior ON

STANDS · SWINGS · PORTABLES

for CASTINGS & FORGINGS

ALLOY IRONS
PEARLITIC MALLEABLE
CARBON STEELS
GREY IRON
COPPER
BRASS
ALUMINUM
MAGNESIUM
ALLOY STEELS
HARD MALLEABLE
STAINLESS ALLOYS
SOFT MALLEABLE
BRONZES
TITANIUM
MANGANESE STEEL

PRODUCTION of fast cutting, economical snagging wheels — that's our business! — and we can serve you well! When we say Electro grinding wheels are "increasingly superior" we mean that our technicians are constantly exploring new materials, unusual formulations and different methods for manufacture. Electro snagging wheels are, in fact, unique.

If you are not currently using Electro Wheels we should welcome an opportunity for one of our abrasive specialists to explain some of the ways we believe Electro can reduce your snagging costs.

Electro Refractories & Abrasives Corporation

ALL TYPES OF RESINOID & VITRIFIED GRINDING WHEELS · 344 DELAWARE AVE., BUFFALO 2, N.Y.

Encircle No. 208 on postpaid card

Letters to the Editor

Wheel Dressers

We have received the December 1955 issue of "Grinding and Finishing" and have particularly noted the article appearing on page 54 of this issue.

As during the past fifty years our firm has been more or less recognized as headquarters for grinding wheel dressing information and as we manufacture the only complete line of grinding wheel dressers and cutters and many more types and sizes than any other manufacturer, and our products constitute a majority of dressers and cutters in use, we would like to bring to your attention a number of points in this article that do not seem to correspond to proper wheel dressing procedure, both as a matter of general use and design of the dresser involved.

The photograph in the lower left corner of page 54 illustrates the operator using a single handle dresser which contains an abrasive wheel such as is illustrated at the bottom of page 16 of our attached catalog under the heading of "Single Handle Type." This particular type and model dresser is probably used in less than 1/10 of 1% of wheel dressing operations. Where such abrasive wheel dressers are used they are more commonly used in the double handle type where a tool rest is not available, or for use on narrow faced soft wheels where a steel star type dresser would tend to break down the wheel too rapidly or disfigure the smooth cutting face.

. . . All of these dressers are constructed with feet which are designed to be placed over the tool rest between the tool rest and the grinding wheel and in so doing the tool rest would have to be considerably further away from the wheel than ⅛". The purpose of these feet is to enable the dresser to be accurately traversed across the tool rest to give an accurate finish to the grinding wheel and also to provide a leverage so that pressure can be brought against the grinding wheel by raising the handle as demonstrated in the attached 8"x10" photograph in which you will note that the feet are rested in front of the tool rest and the dresser is traversed across the face of the wheel with the left hand and pressure can be applied to the grinding wheel by raising the dresser up with the right hand. Without the design and use of dressers in this manner and if they were to be held against the wheel only by the hands, any high spots in the wheel would tend to push the dresser away from the wheel and dressing would accentuate the high and low points rather than remove the high points and give a uniform circumference.

Since over 90% of the mechanical dressers on the market manufactured

Photo which appeared on page 54 of the December issue.

Photo from Mr. McConnell showing the more popular method of dressing wheels.

Grind more carbide tools per wheel and grind them better with Cortland

POROUS TYPE **GREEN CARBORA WHEELS**

THIS WHEEL
will not leave our factory unless all specifications for grade, uniformity, truth, balance and strength have been met.

Your costly carbide tools will give better performance and last longer when properly ground. To obtain proper grinding, use Cortland plate-mounted Green Carbora porous type wheels. Uniformly induced porosity throughout the wheel provides adequate chip clearance and insures fast stock removal. The sharp, cool cutting "green grit", together with Cortland's special carbide wheel bonds, produces the required finish and a longer lasting cutting edge on the tools. Wheels are securely vulcanized to steel backing plates.

For fast service the following standard sizes are carried in stock: 6 x 1 x 4, 7 x 1½ x 5, 10 x 2 x 7 and 14 x 4 x 11.

Cortland carbide grinding wheels are also available in straight sizes, recessed types and cups.

CORTLAND GRINDING WHEELS CORPORATION

Chester, Massachusetts

Do you have a grinding problem? If so, we are sure we can help you — with a Cortland **job-engineered** wheel. Let's get together.

CORTLAND

Encircle No. 209 on postpaid card

not only by ourselves but other wheel dressing firms, are designed with these feet which are intended to be placed over the front of the tool rest, we felt that we should certainly bring these wheel dressing points to your attention as otherwise some of your readers might overlook the proper use of the majority of mechanical dressers that they now use.

Thanking you for the opportunity of mentioning the design of most of the dressers on the market, as well as their proper use.

R. S. McConnell, President
The Desmond-Stephan Mfg. Co.

We very much appreciate reader McConnell taking the time to write us. We hope our readers will be helped by his observations.

Mr. McConnell has also kindly consented to write an article on dressers; their proper use, the different types available for certain operations, their care, etc. This will appear in a near future issue.

Spray Mist

In your December issue of Grinding and Finishing, there is an article starting on page 42, about carbide tool grinding in the Douglas Aircraft plant in El Segundo, Calif.

In this article on page 45, it states, "Douglas uses a water soluble fluid in a mist spray."

Where could we obtain the information pertaining to the type of atomizer they use to apply this mist, is it manufactured by some one, if so, whom? Or is it made special by them? Any information you could furnish us pertaining to the design of same would be greatly appreciated.

H. B. Smith
Lewis-Shepard Co.

The spray mist mentioned in the article on carbide tool grinding at the El Segundo Division is accomplished by a Bink's spray nozzle. The Bink's spray is attached to the fluid line.

This Bink's spray is a stock item available from most parts stores.

Abrasive Grinding Emery Wheel

We are interested in finding a manufacturer of abrasive grinding emery wheel for double disc grinding equipment for grinding hard drawn 18-8 stainless steel springs in wire sizes ranging from .055-in. to .312-in. material.

For the past 12 years we have tried a number of manufacturers with poor results to date.

Do you suppose there may be a grinding wheel supplier in the far west that we have overlooked? What about a Canadian supplier or a European supplier?

We have enjoyed the articles in your magazine GRINDING and FINISHING very much.

Any information you can render will be deeply appreciated. We are in the so-called "dog-house" on stainless steel grinding.

Arthur N. Avallone
Associated Spring Corp.
Wallace Barnes Co.

Any suggestions you may have to offer reader Avallone will be greatly appreciated.

Centerless Grinding

Page 10, December 1955 issue—Centerless Grinding.

Am very interested in learning about the Lidkoping grinder. Can you help or direct me?

W. F. Herbert, Prod. Super.
Coors Porcelain Co.

I found the article "Centerless Grinding" which appears in the January 1956 issue of GRINDING and FINISHING both interesting and informative. I should like, however, more information about the Lidkoping machines mentioned in this article.

Will you please tell me to whom I should write for additional information and prices.

E. F. Boron, Chief Eng.
Mallory-Sharon Titanium Corp.

We should appreciate very much your telling us where we may obtain complete, detailed information covering Malcus centerless grinders. We believe that these are manufactured in Sweden.

Robert L. Shell
Guyan Machinery Co.

Complete information on Swedish Lidkoping centerless grinders may be obtained from the Triplex Machine Tool Corp., 75 West St., New York 6, N.Y. Any information on the distributor of the Malcus centerless grinder will be appreciated.

Precision Barrel Finishing

. . . We are planning to look into modifying our barrel finishing methods to reduce grinding and deburring costs. With this in view, I was greatly interested in your article on Barrel Finishing, of which, unfortunately, I have only part 2. I would appreciate receiving reprints or tear sheets of the complete series.

I feel that a study of the series will enable us to more intelligently plan our program.

P. J. Walker, Prod. Eng.
Skillman Hardware Mfg. Co.

Just a note to tell you how much we appreciate your publication!

In the December issue, you stated that reprints were available of an article entitled "Abrasive Grains" by J. J. Forrester. If you have any left, we would like a couple of these.

Also, in your January issue, you note that reprints on the Precision Barrel Finishing series by Shipley and Biebel will be available sometime in February. Will you please reserve two of these for us as we think they will be very helpful.

Asher Nesin, Factory Mgr.
American Abrasive Co., Inc.

We are very much interested in the article "Industry Cuts Costs, Ups Production With Precision Barrel Finishing" by Morris S. Shipley and William A. Biebel, contained in the September issue of Grinding and Finishing. We should like to receive a copy of the October issue of this magazine which we believe contains the second part of this article.

J. Y. Arnold
Supervisor of Prod. Eng.
The Carpenter Steel Co.

Could you please send us either a copy of your November 1955 issue or tear sheets of your article "How To Get Best Results With Precision Barrel Finishing part 3: Types and Use of Media and Compounds."

We are interested in setting up tumbling procedures for experimental parts which will be released to our plants and these articles seem very helpful.

J. B. Jones
Special Materials Dept.
Remington Rand

Reprints of the series on Precision Barrel Finishing are expected from the printers very shortly and all requests will be taken care of as soon as possible.

Standard Data

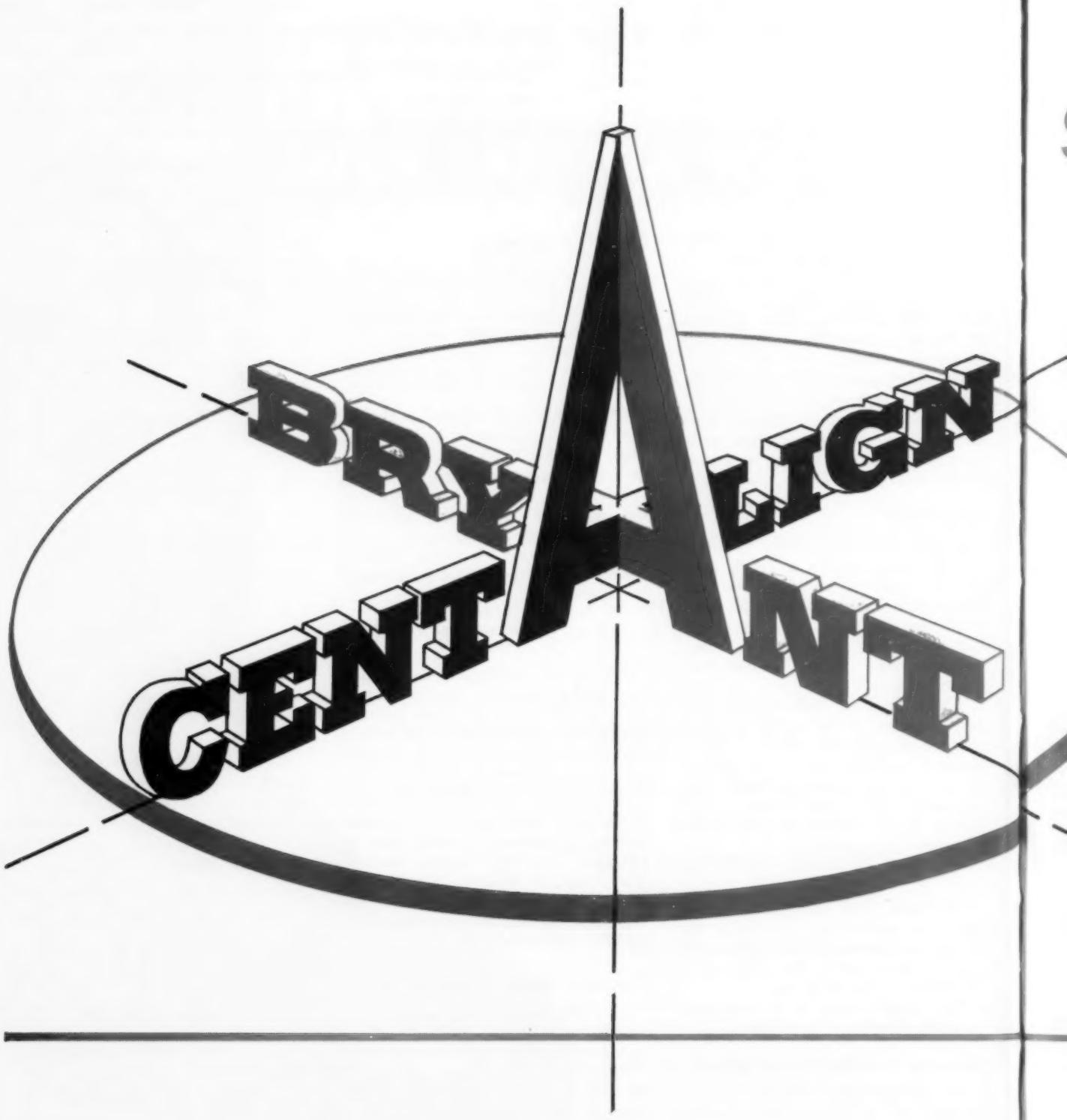
We would appreciate receiving from you ten copies (complete) of the article "How Grinding Standards are Established With Standard Data" by E. A. Cyrol. Part 1 of this article was featured in the May 1955—Volume 1 No. 1A of GRINDING and FINISHING.

Kenneth Philp, Supt.
Works Standards - Dept. 132
Ford Motor Co. of Canada, Ltd.

It would be greatly appreciated if you would send us a reprint of your articles, "Oscillating Grinding Values Established with Standard Data."

I was fortunate to find Part II of this article in your June issue of this year and found it extremely interesting. However, I would like to read the preceding article Part I.

Wallace D. Arnold,
Ind. Eng.
Adel Precision Products


BRY
ALIGN
CENT
ANT

Symbol...

of the higher production, lower cost internal grinding you've been looking for -

BRYANT CHUCKING GRINDER CO.

85 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

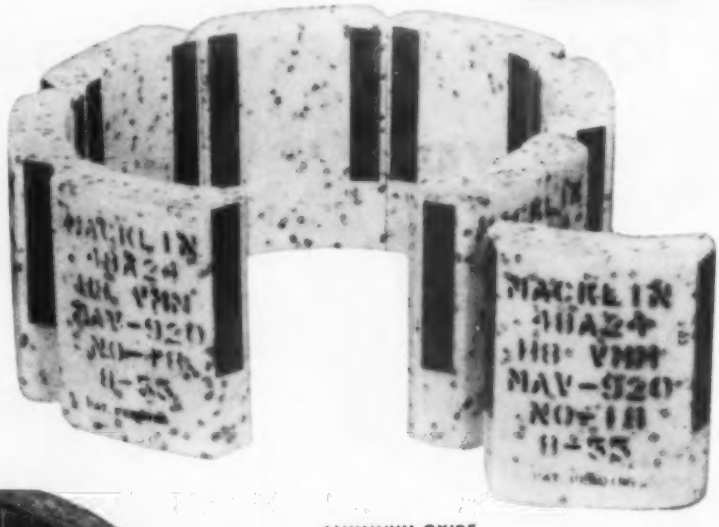
Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates • Magnetic drum memory devices for computing systems

Encircle No. 210 on postpaid card

MACKLIN·M·M· Segments • • • •
are tops for *Surface* grinding

MACKLIN GRINDING WHEELS

Whatever your grinding job, if you are using segmental wheels, you owe it to yourself to try the new MACKLIN M.M. process segment. The unique construction of fine abrasive in pellet form, engineered in these wheels, gives a constant flow of fine abrasive particles between the wheel and the work, thereby eliminating the time and cost consuming dressing operations so prevalent with most grinding wheels.



ALUMINUM OXIDE

SILICON CARBIDE

Whether your job is long production runs or short runs of miscellaneous materials, there is a MACKLIN M.M. specification tailored for your particular problem. Scores of users are reporting outstanding performance in grinding everything from AIRDI to ZIRCON.
Won't you give us your opinion?

Call your Macklin distributor today and arrange for the services of a Macklin Engineer so that you too may be a production winner.

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS AND OTHER ABRASIVE PRODUCTS
JACKSON, MICHIGAN

Encircle No. 211 on postpaid card

Why hats are off to CIMCOOL...

... because CIMCOOL® has become, in just a few years, the largest selling cutting fluid in the world. And sales of this radically new and different coolant are continuing to climb because CIMCOOL Standard Concentrate has two big advantages over old-fashioned cutting fluids:

- **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and increases tool life, for it combines friction reduction and cooling capacity in a degree never before attained.

We'll be happy to supply information on the many specific advantages of CIMCOOL Standard Concentrate—or details on the entire family of CIMCOOL Cutting Fluids. Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you —without cost or obligation. Wire, write, or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Base Additive** — For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

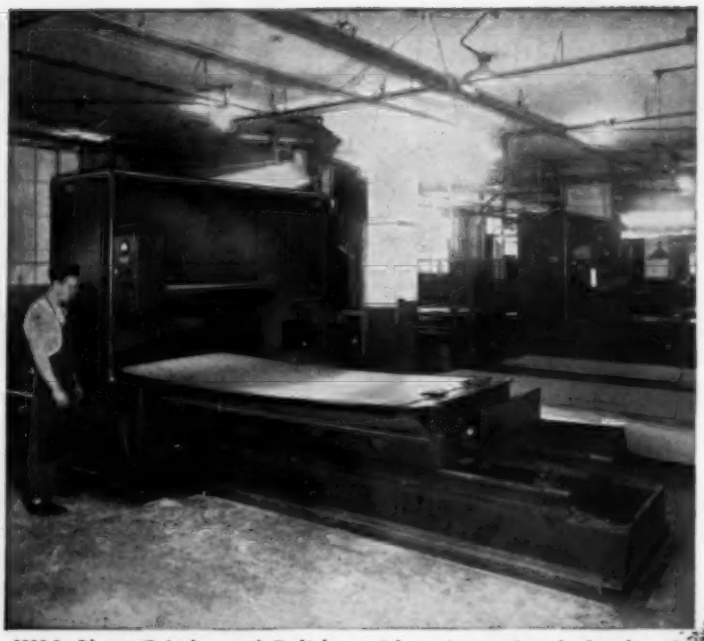
CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

Encircle No. 212 on postpaid c

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.



HILL Sheet Grinder and Polisher with reciprocating hydraulic table processing individual sheets.

HILL

GRINDING and POLISHING MACHINES

How much is it costing you to produce ACCEPTABLE finishes on FLAT surfaces

HILL Pinch Roll Grinder and Polisher for "Wet" or "Dry" operations. (Shown in series for straight line production)

HILL 2-Roll Vertical Abrasive Belt Grinding and Polishing machines are the logical result of 25 years of research and experience in producing self contained units for successfully processing ferrous and non-ferrous sheets. We have consistently proven that wide abrasive belt grinding and polishing equipment must incorporate these fundamental features — rugged construction, simplicity of design, accessibility, versatility and centralized controls.

HILL abrasive belt polishing machines are recommended for continuous operation and insure lower production costs with superior finishes as required today by the manufacturers of decorative plastics, food processing equipment, automobile bumpers, lithographers and photo engravers plates, home appliances, etc., etc.

Both types of machines are normally built up to 60″ wide, and larger capacity equipment can also be furnished.

Your inquiries are solicited for detailed information and recommendations.

TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

Encircle No. 213 on postpaid card

The Editor's Page

What is the First Law of Business?

The first law of sound business management should be intelligent frugality. A business in which the luxury of spending is viewed as a means to obtaining practical, beneficial results is a healthier operation than that business which carries about with it the dear pleasures of wasteful appropriations and extravagant expenditures regardless of maximum benefits to be derived therefrom. Frugality and intelligent expenditures are to a business what leanness and muscles are to an athlete.

But frugality is not penny pinching. Fiendishly hacking off appropriations in an effort to save money rather than as a means of streamlining production is merely hacking at the muscles of the athlete as well as the fat. No mutilated athlete ever won anything except a hospital bed; penny pinching businesses don't win much more.

When expenditures are to be made the intelligent manager asks: . . . of an expenditure for new equipment, Will it increase production? By how much? . . . of the cost of hiring additional managers, Will the managerial force achieve objectives faster? Will it release men for deployment on special projects? . . . of an advertising appropriation, Will it reduce salesmen's calling time? Will it increase sales?

When these questions are answered affirmatively the expenditure is approved. Frugality expects a just return from each investment; equipment is bought, production methods are streamlined, advertising campaigns reduce sales costs, wages are increased to reduce the expense of labor turnover, and a hard hitting, ambitious organization secures its place in the sun.

But what of the nickel and dime boys? Ah, you know them well; frugality carried to absurdity. No expenditures for new equipment, but a large maintenance crew to keep the old wrecks clanking another day . . . no well-paid managers, only mediocre talent, the intelligent and ambitious find other jobs . . . no advertising campaigns, but a high sales cost . . . no intelligent handling of salesmens' commissions, only expensive low sales volume . . . what, hire a firm of consultants to analyze our business? Listen, young fellow, I've been in this business for a good many years, and I guess I know how to run it. I don't hold with these fancy specialists. We're doing O.K.

The penny pinchers are easily recognized; a high labor turnover, an apathetic sales force, low production, inferior equipment, a mediocre product. Penny pinching is a disease which spreads its poison into every vein and viscera of the body. It corrupts initiative, corrodes teamwork and causes dissension and disunity. It never results in the full development of a company.

Let us have instead, intelligent frugality. Send forth a dollar so that it may return leading little dollars by the hand. A healthier, better business will result. Hack off the fat, yes, but save the muscle.

Wm. J. Schleicher

Editor

Flexible raised-hub disc as used to clean weld metal from welded gear tooth on repaired gear. Flex wheels also find extensive use in deburring teeth on gear castings. (Bay State Abrasive Products Co.)

The New Flex Wheels . . .

- ✓ *use them in foundries, machine shops, welding departments, maintenance, etc.*
- ✓ *use them on steel, weldments, plastics, rubber, screens, conduits, iron, etc.*
- ✓ *use them right down to the arbor, shank or nut.*
- ✓ *use them to cut on both sides as well as the face.*
- ✓ *use the same wheel for steel, tile, etc.*
- ✓ *use them at high speeds and get increased production.*

they're tough . . . fast cutting . . . versatile . . . flexible . . . safe

By **Jack Kenyon,** Associate Editor

● Wherever portable grinders are used for removing rust and scale, cutting down weld beads, cutting off gates and risers of castings, burring steel parts, blending weld contours on all types of fabricated work, removing mold marks on castings, preparing casting surfaces for painting—in all these applications and more, reinforced resinoid wheels offer the advantages of toughness, flexibility, fast cutting action, light weight, and easy manipulation. Used in portable disc-sander applications in cleaning concrete and smoothing terrazzo decking, their speed of cutting matches that of sanding discs, and their useful life is much greater. In some foundry applications, where three tools—air chisels, cup shaped wheels, and sanding discs—were formerly used in cleaning castings, flexible reinforced wheels have been able to take over all three jobs, doing them more quickly and much more economically. Sheet metal

Flex wheel being used in a way that employs the wheel periphery, in a typical slotting operation. This type of wheel can be so used without danger of spalling, breakage or ravelling. Note that the side of the wheel guard has been removed for picture purposes only. (Chicago Wheel & Mfg. Co.)

Knocking down and blending weld beads in sheet metal fabrication work is a primary use of flexible reinforced wheels. (Norton Co.)

fabricators have been quick to spot the advantages of flex wheels, using them on right-angle grinders for knocking down welds and blending them into surrounding metal. Applications haven't been limited to the portable-grinder field. Many shops are finding them extremely useful as all purpose cutoff wheels for a wide range of materials, including BX cable, conduits, plastics, Celotex, Masonite, wire screening, and other composition materials. So far, uses for these remarkable wheels range all the way from finishing sterling silver fork tines to cutting masonry walls, and the list is still growing.

What characteristics make flexible wheels so useful in so many applications? The outstanding feature of the wheels is their built-in strength and safety. They are made by impregnating cotton fabric with abrasive grain and laminating the resulting layers with a strong organic bond. The fabric fibers serve to reinforce the entire structure of the wheel. The result is a wheel of great resilience—one which has high tensile strength and impact resistance, and which can be operated on portable or stationary equipment with a much higher factor of safety than conventional discs and wheels. Surface speeds much higher than permissible speeds for conventional wheels can be safely used with reinforced wheels. Long-wearing properties are characteristic of these wheels, and they can be used right down to the

Cutting off heavy angle iron with a portable saw using a flex wheel. The general purpose cut-off wheel is recommended for cutting and slotting such materials as angle iron . . . tool steel . . . drills . . . steel files . . . BX cable . . . brake lining . . . stainless steel angles, sheets, small diameter bar stock, thin wall pipe and tubing. (Carborundum Co.)

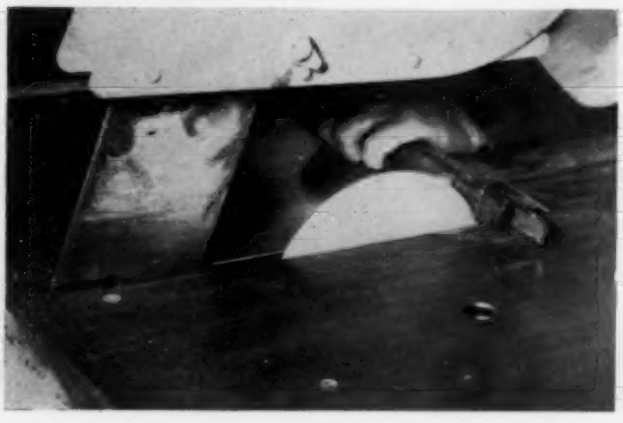
Snagging operation on a large flywheel, using a depressed-center type wheel on a portable right angle grinder. Note that the periphery of the wheel is used, at a slight angle to the work. The advantage of the flex wheel in this type of application is its ability to travel to the work, which in this case is heavy. (Chicago Wheel & Mfg. Co.)

arbor, shank or nut.

Fast and clean cutting action is an outstanding property of the new wheels. In cutoff demonstrations they have shown the ability to cut hardened steel right after cutting asphalt tile, a feat that would be impossible for ordinary wheels because of loading. Many uses for flex wheels depend on the fact that they cut on both sides as well as the face. This ability makes them useful for cutting intricate template shapes from sheet stock of all types of materials. Because they are resilient, they resist side pressures and side impacts which no ordinary straight wheels could stand. Most of the applications for these wheels depend on this ability to "roll with the punch" and come back cutting. And this resiliency results in excellent surface finishes where flex wheels are used.

Right—Preparation of a large piece for metallurgical examination by snagging with a flex type wheel. These wheels are extremely useful in snagging operations. (Chicago Wheel and Mfg. Co.)

The flex wheel is recommended for cutting thin wall pipe and tubing and light angle irons with a table saw. It is also effective for cutting all forms of carbon steel, Monel metal, brass, bronze and copper. Aluminum and aluminum alloys are also cut with ease. (Carborundum Co.)



Flex wheels come in straight and depressed-center types, and in a wide range of grit sizes. In aluminum oxide, they are offered from 16 to 320 grit, and in silicon carbide from 12 to 80 grit. Several grades ranging from soft to hard are available. Thickness of the discs and depressed center types runs from 1/16" to ¼".

Limitations of flex wheels should be realized by the user as well as their capabilities. They should not be specified for very heavy stock removal in cleaning and deburring castings. Here it would be better to use a heavier duty glass reinforced wheel or a standard cup type wheel. In reducing and blending welds on very light gauge sheet metal, trouble may be experienced in the flex wheel's grinding

Flex wheel being used on bench grinder with straddle plate to cut off decorative angle stock. Resilience of the flex wheel makes it adaptable to many general shop uses. (Macklin Co.)

Cutting out a template from sheet stock using a flex wheel. These wheels withstand side pressures and cut on both sides as well as the face. (Macklin Co.)

through the thin sheets in addition to the weld, because of the fast cutting action. In all applications for flex wheels, care must be used to see that they operate at the high speeds recommended; slower speeds will result in poor performance.

Techniques for Using Flexible Reinforced Wheels

As has been mentioned, speed is the critical factor in using flex wheels. Best results are obtained when they are used at the highest recommended speed of the manufacturer.

In grinding welds and in surface finishing with flex wheels, the wheel should be applied to the work surface at an angle of 10 to 45 degrees, letting the forward edge do the cutting through its high rotational speed. The wheel should not be held flat on the work, because the operating speed of the wheel will be reduced below efficient levels. Flex discs and depressed-center wheels can be used very effectively on portable equipment to work between cooling fins and gear teeth on castings where the use of cup-type wheels would be impossible. Excessive pressure on surfacing and weld removing jobs should be avoided; the wheel speed should do the work.

Sander pads are necessary for using many depressed center wheels to prevent extreme flexing in operation.

The use of flex wheels as light-duty cutoff wheels has reduced the number of laborious hand sawing and filing operations in many shops to a minimum, because the wheels can be successfully applied to so many materials. They are designed for use on bench grinders and saws, portable saws, polishing heads and similar equipment. The danger of breakage due to side pressure on the wheel is no longer present.

Safety precautions for the use of flexible reinforced wheels are much the same for conventional wheels. Adequate guarding is a must; even though the wheels are much safer, guards are still necessary. Manufacturers of the flex wheels give procedures for insuring that the wheels are running true and in balance before use. These procedures should be carefully followed for safe operation. • •

Fast and clean cutting action is an outstanding property of the flex wheels. In cut-off operations they have shown the ability to cut hardened steel right after cutting asphalt tile, a feat that would be impossible for ordinary wheels because of loading. Many uses for flex wheels depend on the fact that they can cut on both sides as well as the face. (Cortland Grinding Wheel Corp.)

Select the abrasive cut-off wheel according to

Are You Getting Your Money's Worth From Your Abrasive Cut-off Wheels?

● Industry uses approximately $8 million worth of cut-off wheels on dry cut-off operations each year. Abrasive manufacturers constantly endeavor to ensure that their customers get their money's worth. The Carborundum Company's Grinding Laboratory recently completed a study to determine ways and means to use abrasive cut-off wheels most efficiently.

In order to do this an extensive series of tests were run under closely controlled conditions and data were compiled that related the various factors that make up the cut-off operation.

A chopper type machine was chosen for the tests because it is representative of the majority of machines that are used for dry cut-off. It was powered by a direct current motor which provided an infinitely variable speed, and the power consumed in the operation was measured by an indicating wattmeter. Figure 1 shows the machine and the power measuring equipment.

Factors That Influence Cut-off Operations

The factors that influence a cut-off operation include such items as: abrasive cut-off wheel, abrasive wheel speed, production rate, quality of cut and material cut.

The abrasive wheel itself contains four items that affect the cutting performance of the wheel. For example—a typical wheel marking is A30-T-B7. This marking means the following: A—Aluminum oxide grain type; 30—grain or grit size; T—wheel grade or wheel hardness and, B7—resinoid bond that holds the grains together.

In any one bond type the grit size can vary and the hardness or grade of the wheel can change, and

the requirements of the operation.

By **John A. Mueller,** Manager,
Grinding Laboratory
Bonded Abrasives Division
The Carborundum Company
Niagara Falls, New York

- ✓ for long life use coarse grit wheels
- ✓ for superior quality of cut use fine grit wheels
- ✓ to cut large areas use soft grade wheels
- ✓ to cut small areas use hard grade wheels
- ✓ to cut hard materials use soft grade wheels
- ✓ to cut soft materials use hard grade wheels
- ✓ a wider wheel will produce longer life, generate poorer quality and require more power
- ✓ a thinner wheel will produce shorter life, generate superior quality and require less power

either of them or some combination of both of them can materially and substantially affect the performance of the wheel. The standard of comparison by which the effect of any one variable may be measured is simply the number of cuts that can be made with the wheel. The greater number of cuts, the more efficient is the wheel. Quality of cut is a related item of comparison together with the power that is consumed in the cut-off operation. The power reveals the free cutting characteristics of the wheel together with the motor capacity and general ruggedness that are needed in a cut-off machine to do an effective cutting job.

Abrasive Wheel Speed

The effect of wheel speed on abrasive cut-off operations is well known to the industry. It is commonly agreed that as the wheel wears from full size to stub size, the wheel effectively acts softer. This means that the efficiency is decreased and that the wheel wear becomes progressively greater. However, what industry may not know is how much faster does a wheel wear as it is reduced in diameter.

Figure 2 vividly presents the loss in wheel life as it wears down from full size, when it is run at both constant rpm and constant sfpm. In the first two inches of wear at constant rpm, the graph shows 34% loss in efficiency. The wheel wear then levelled off and for the next two inches there was only an 11% decrease in efficiency. After the wheel reached a diameter of 10 inches there was a rapid increase in the rate of wear and when the wheel reached a diameter of 9 inches it had lost 70% of its cutting efficiency.

Figure 2 also shows that to recover the 70% loss in cutting efficiency due to decreased wheel speed, all that is required is to maintain the wheel speed at a constant sfpm. The graph clearly points out that when the wheel sfpm remains constant, the wheel operates at a constant efficiency.

1. "Chopper" type machine used throughout these tests, showing power measuring equipment. The indicating Wattmeter can be seen at the extreme left of the operator.

From Figure 2 several conclusions can be distinctly drawn that will aid the consumer in reducing his abrasive cut-off costs. They are as follows:

1. *Operate all abrasive cut-off wheels at the manufacturer's recommended speed. If wheels are operated below the recommended speeds the wheel will not perform at the maximum efficiency and abrasive costs will be increased.*

2. *Operate abrasive cut-off wheels at constant SFPM. This probably cannot be done in all operations but what can be done particularly when there are two or more machines in the plant, is to operate one machine at a speed consistent with the full size diameter and then after the wheel wears down 25% put it on another machine that operates at a higher speed but one that is consistent with the reduced diameter. In this way increased efficiency will be obtained from the wheel throughout the life of the wheel and abrasive costs will be cut to a minimum.*

Time Per Cut Or Production Rate

Time per cut, pieces per minute, production rate or whatever it may be called is a vital factor in the cut-off operation. The time per cut profoundly affects wheel life and quality of cut and itself is dependent upon the power available on the machine.

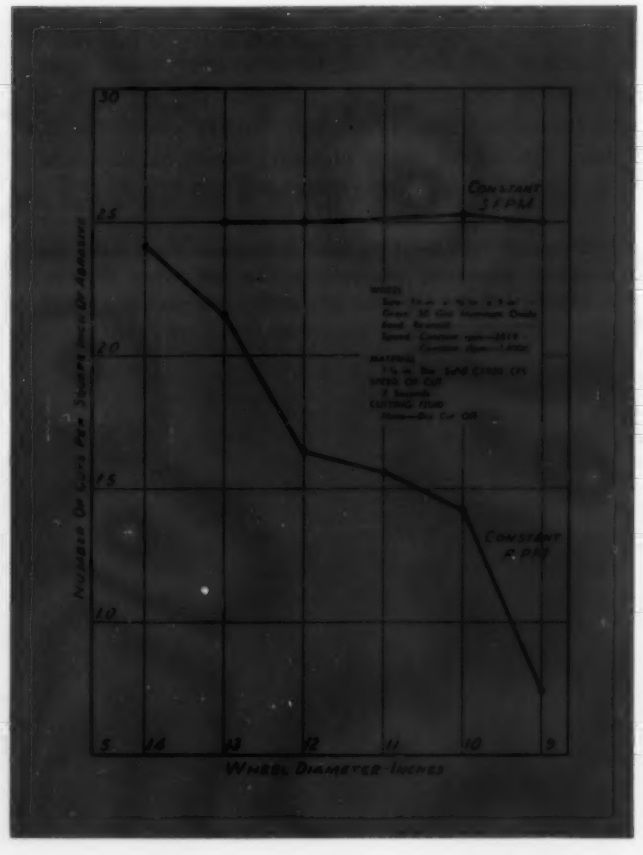
Figure 3 shows the wheel efficiency as it is related to the time it takes to cut through the piece. As the time of cut was increased from 1 second to 2 seconds,

continued

2. Showing the loss in wheel life as it wears down from full size, when it is run at both constant rpm and constant sfpm.

WHEEL
Size: 14-in. x ⅛-in. x 1-in.
Grain: 30 Grit Aluminum Oxide
Bond: Resinoid
Speed: Constant rpm—3819
Constant sfpm—14000

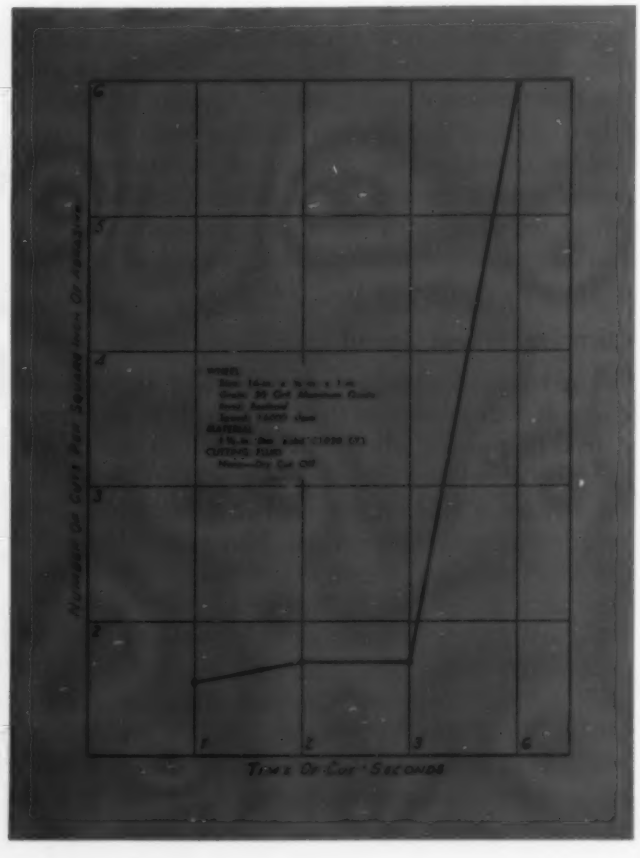
MATERIAL
1⅛-in. Dia. Solid C1020 CFS
SPEED OF CUT
2 Seconds
CUTTING FLUID
None—Dry Cut Off



3. As the time of cut is increased from one second to two seconds wheel efficiency is increased 10%.

WHEEL
Size: 16-in. x ⅛-in. x 1-in.
Grain: 30 Grit Aluminum Oxide
Bond: Resinoid
Speed: 16000 sfpm

MATERIAL
1⅛-in. Dia. Solid C1020 CFS
CUTTING FLUID
None—Dry Cut Off



wheel efficiency was increased 10%. Another second increase in the time of cut had no effect on the wheel efficiency. However, when the time of cut was lengthened to 6 seconds wheel efficiency increased 285%. It is apparent then that the longer the wheel takes to go through the workpiece the greater will be the life of the wheel but more burn on the work will result. This is logical and reasonable and can be explained by physical laws. A short time of cut means that more work per unit of time is being done by the wheel than when the time of cut is lengthened. More work per unit of time means more pressure is put on each grit of the wheel and an increase in pressure results in more wheel breakdown.

The more breakdown that occurs in the wheel means that it is acting softer and consequently the amount of burn produced on the workpiece should decrease. Figure 4 shows the burn produced at various rates of cut and this figure emphasizes the fact that the slower the cut, the more burn is produced and conversely the faster the cut the better the quality of cut.

The time of cut brings up another factor that is highly important in the cut-off operation. The faster the cut, the more work per unit of time is accomplished. The faster that work is done the greater amount of power is required to do it. Figure 5 shows the power that is consumed when the rate of cut is changed. By lengthening the time of cut 1 second, power consumption dropped 46% and by lengthening it to 6 seconds, power dropped 78%. Manifestly then, if a high cut-off production rate is required, adequate power must be available. If only a limited amount of power is available, production will be limited to that power.

Figure 5 together with Data Sheet I provide a pertinent contribution to the cut-off industry. Data Sheet I shows the rate of metal removed at each time of cut. An abrasive cut-off wheel was capable of cutting metal as fast as 60 square inches per minute and a review of the power consumed shows that approximately 1/3 horsepower was necessary to cut one square inch per minute.

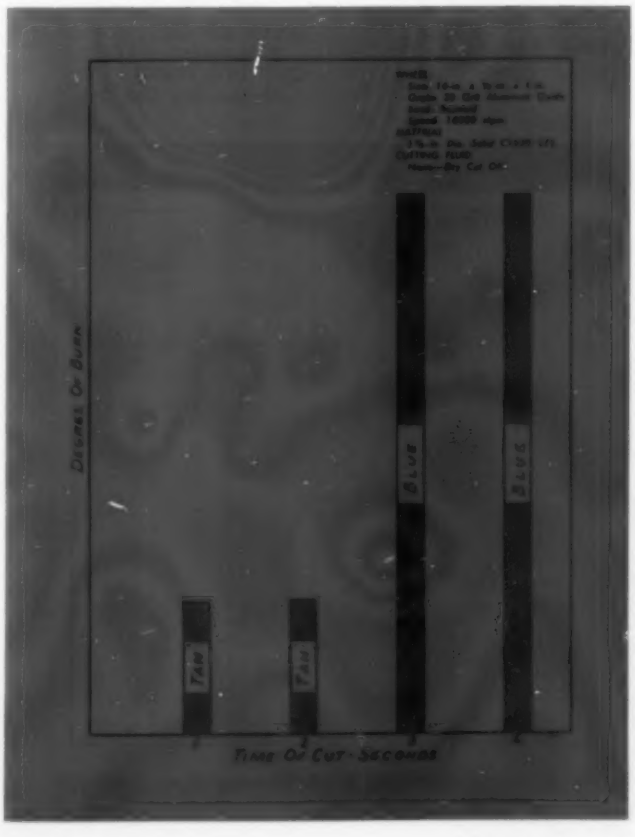
The time of cut, therefore, has been shown to influence the cut-off operation to a major degree.

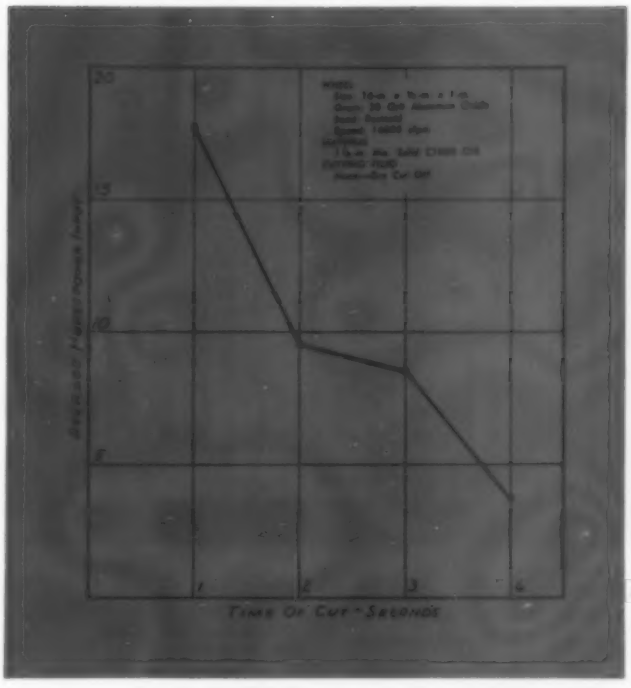
4. The slower the cut the more burn is produced, and conversely; the faster the cut the better the quality of cut.

WHEEL
Size: 16-in. x ⅛-in. x 1-in.
Grain: 30 Grit Aluminum Oxide
Bond: Resinoid
Speed: 16000 sfpm

MATERIAL
1⅛-in. Dia. Solid C1020 CFS

CUTTING FLUID
None-Dry Cut Off





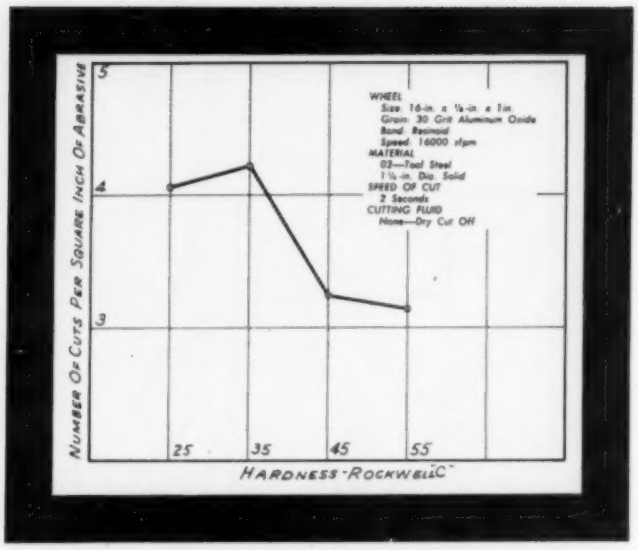
WHEEL
Size: 16-in. x ⅛-in. x 1-in.
Grain: 30 Grit Aluminum Oxide
Bond: Resinoid
Speed: 16000 sfpm

MATERIAL
1⅛-in. Dia. Solid C1020 CFS

CUTTING FLUID
None—Dry Cut Off

5. The faster the cut, the more production. However, the faster the work is done the more horsepower is required.

As the wheel dwells in the cut it tends to glaze and to generate more and more heat. The more heat that is generated the hotter the work becomes and eventually it will severely burn the work and be visually noticeable.



WHEEL
Size: 16-in. x ⅛-in. x 1-in.
Grain: 30 Grit Aluminum Oxide
Bond: Resinoid
Speed: 16000 sfpm

MATERIAL
02 - Tool Steel
1¼-in. Dia. Solid
SPEED OF CUT
2 Seconds
CUTTING FLUID
None - Dry Cut Off

6. Wheel efficiency varies with the hardness of the material but not in a straight line relationship.

In summary, a fast rate of cut means high production, low labor cost, low wheel life and good quality of cut. Therefore, to operate at maximum overall efficiency and to keep the total cut-off cost to a minimum, cut as rapidly as the power on the machine will permit. To operate at minimum cost it is also necessary to provide adequate power so that a proper selection of abrasive cut-off wheels may be made.

Hardness of Material

To expand the story on cut-off, a series of tests were run to determine what effect the hardness of the material that is cut has on wheel performance. Figure 6 shows that wheel efficiency varies with the hardness of the material but not in a straight line relationship. Materials with a hardness less than Rockwell c35 broke the wheel down faster than materials with a Rc35 hardness. Materials harder than Rc35 likewise broke the wheel down at a more rapid rate.

From a wheel selection point of view, Figure 6 shows that soft materials are not the easiest to cut and therefore maximum efficiency cannot be expected from a wheel that is used to cut both hard and soft materials. Generally the softer the material is, the harder the grade of the cut-off wheel can be. In cutting the harder materials another factor must be considered—namely, burn and check of the materials. Too hard a wheel will burn and check the workpiece so that a general trend is to use a softer wheel when cutting hard materials.

Abrasive Wheel Grit

Up to this point the abrasive cut-off wheel has not been considered, but only the factors that make up the cut-off operation. Now the abrasive cut-off wheel itself and the effect it has on the cut-off operation will be considered.

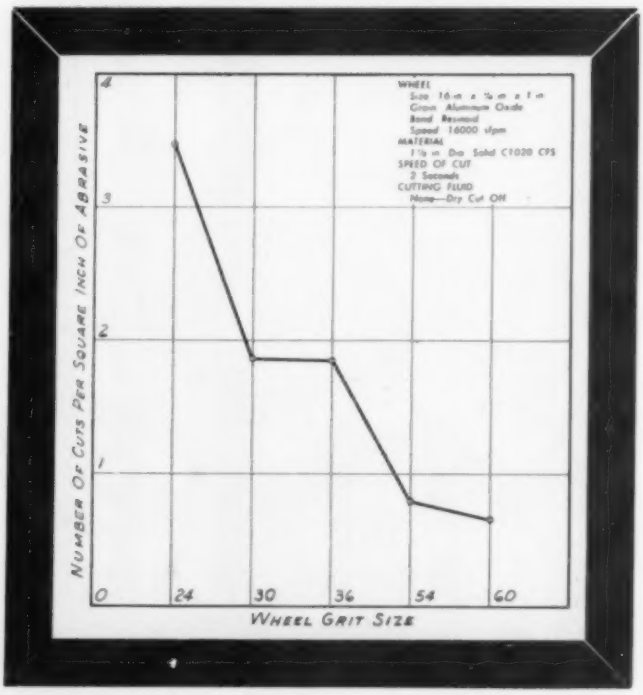
Grit size provides a method of varying the performance of a cut-off wheel to adapt it to the requirements of any specific operation. In normal cut-off operations grit sizes range from coarse 24 grit to fine 100 grit. How much change in wheel performance can be effected by a change in grit size is shown in Figure 7. This graph obviously shows that the coarser grit wheel produced the highest wheel efficiency and that when the grit size became finer the efficiency decreased. A change from 24 to 30 grit cut wheel efficiency 45%. Changing from 30 to 36

continued

7. The coarser the grit wheel, the highest wheel efficiency. When the grit size becomes finer wheel efficiency decreased.

WHEEL
Size: 16-in. x ⅛-in. x 1-in.
Grain: Aluminum Oxide
Bond: Resinoid
Speed: 16000 sfpm

MATERIAL
1⅛-in. Dia. Solid C1020 CFS
SPEED OF CUT
2 Seconds
CUTTING FLUID
None—Dry Cut Off



SPRING STEEL RING

9" O.D. x 6¼" I.D. x .091" 50 pieces (100 surfaces) per hr.; .004" stock per side; limits ±.0005"

CAST IRON END PLATES

30 pieces (60 surfaces) per hour; ⅛" stock removed each side; limits ± .002"

ADJUSTING SCREW WASHERS

Low carbon steel; 200 pieces (200 surfaces) per hour; .025" stock removed; limits ± .001"

HOT ROLLED STEEL CAMS

225 pieces (450 surfaces) per hour; 1/32" stock removed each side; limits ± .001"

NOW! BLANCHARD PRESENTS ANOTHER GREAT NEW GRINDER *with Automatic Cycle Control*

This great new Blanchard Surface Grinder performs a variety of jobs with speed, ease and accuracy.

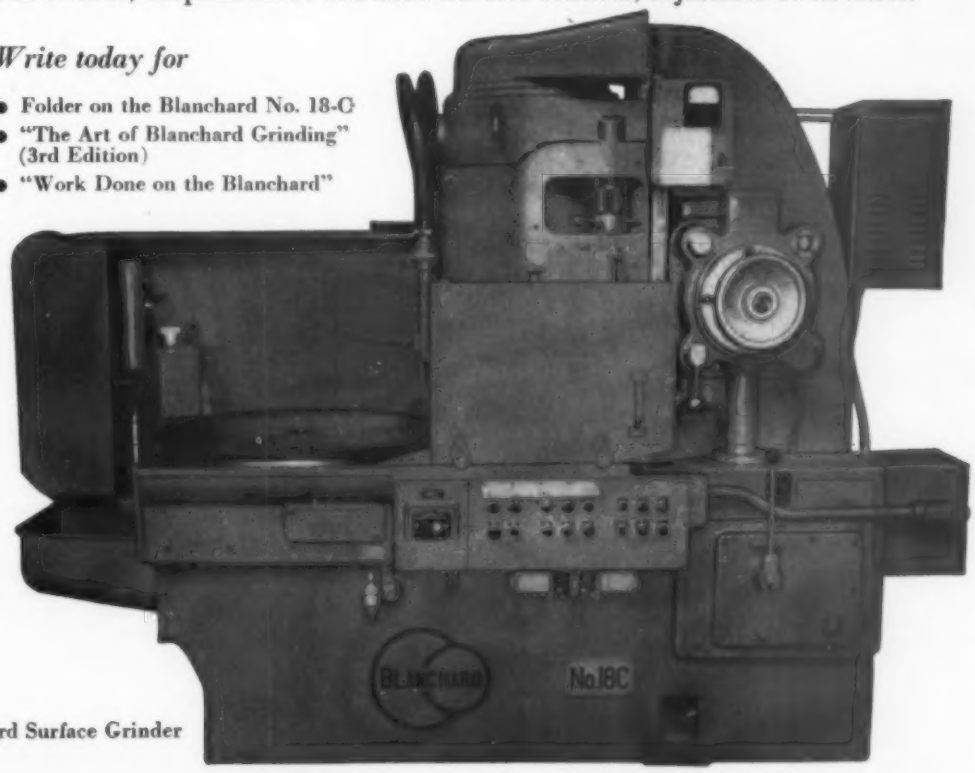
One operator can easily operate two of these No. 18-C grinders under balanced conditions. By using the automatic cycle, he can unload, clean and reload one grinder while the other is grinding.

Here's what the automatic cycle does: moves chuck (30" or 36" dia.) to grinding position and starts it rotating; starts wheel rotation and coolant pump; provides rapid wheel approach to work; engages power down-feed at preset rate; changes to fine feed just before finished size is reached; stops feed when work is to size – "sparks" out; raises wheel head; stops wheel, coolant pump and chuck; moves chuck to loading position – demagnetizes chuck.

This new Blanchard also features: push button selection of manual or cycle operation; size control; simplified feed and head traverse controls; adjustable dwell timer.

Write today for

- Folder on the Blanchard No. 18-C
- "The Art of Blanchard Grinding" (3rd Edition)
- "Work Done on the Blanchard"



No. 18-C Blanchard Surface Grinder

THE BLANCHARD MACHINE COMPANY 64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Circle No. A1 on postpaid card

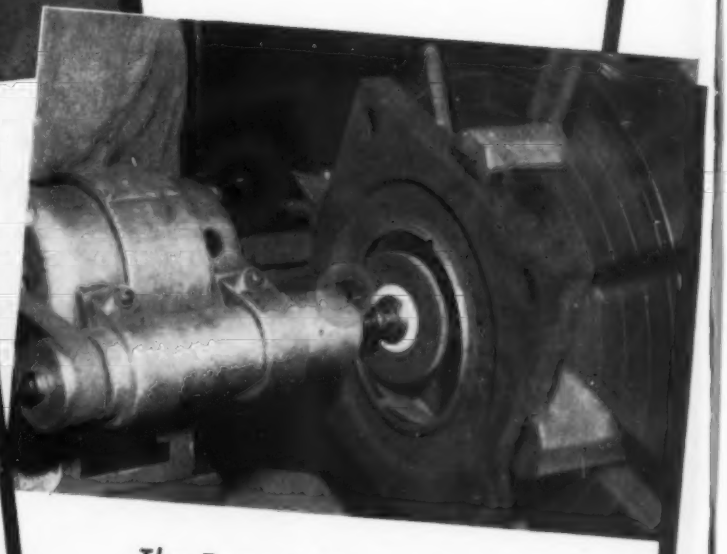
Pages from

The INSIDE STORY of INTERNAL GRINDING by NORTON

How Norton wheels for internal grinding step up your product quality and profits with the "TOUCH of GOLD"

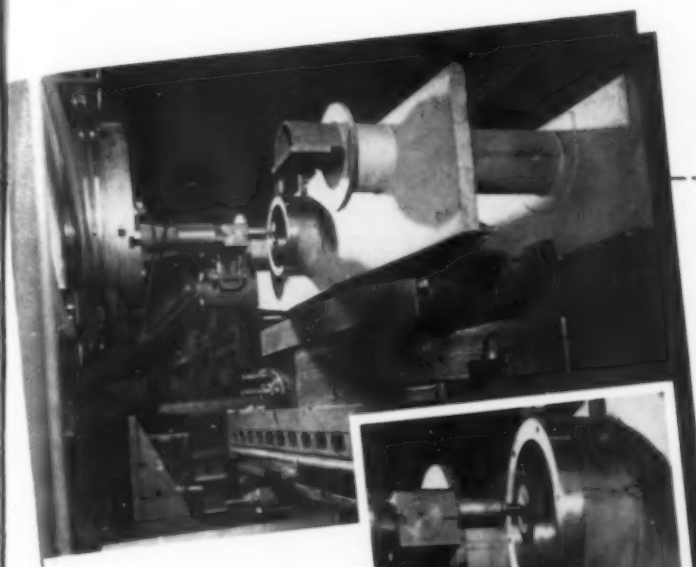
They're Precision-Processed

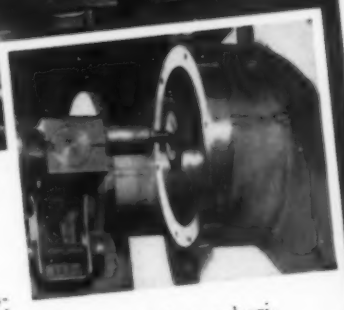
Norton wheels for internal grinding are built by exclusive precision-processing that results in absolutely uniform grinding action, in wheel after wheel of the same specifications. This means you can depend on each Norton wheel of the same specifications for exactly the same grinding action. No fussing with timing cycles when you change wheels — you save on every grinding job. Other typical "Touch of Gold" advantages include their fast, free, cool-cutting action and extra long life. Norton wheels are made in types, sizes, bonds and abrasives for every internal grinding application.



The Famous Norton G Bond

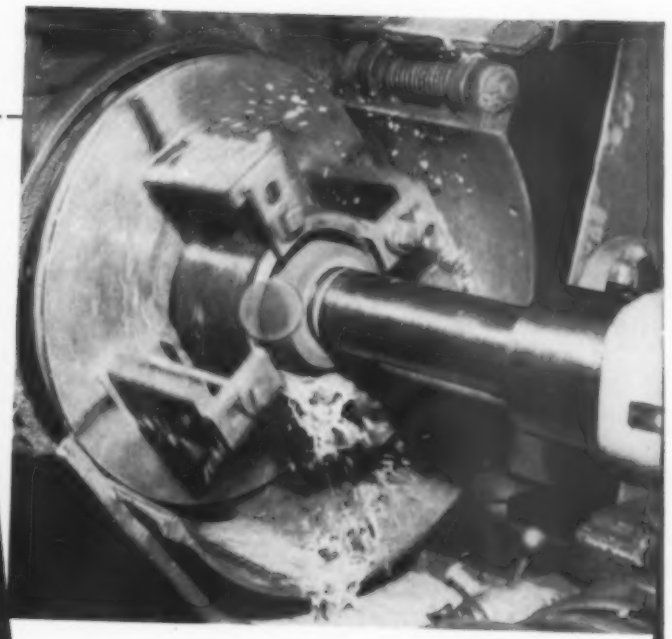
The Norton G Bond is the most efficient vitrified bond ever developed for precision and semi-precision grinding. Holding each abrasive grain just long enough for maximum cutting action, it assures a constant grinding surface of fresh, sharp cutting edges. As a result, G Bond wheels cut cooler and faster . . . produce smoother finishes . . . dress easier and give more pieces per dressing. With Norton 32 ALUNDUM* abrasive — outstanding for heavy feeds and rapid stock removal — it makes an ideal "Touch of Gold" combination for your grinding jobs on steel and steel alloys.





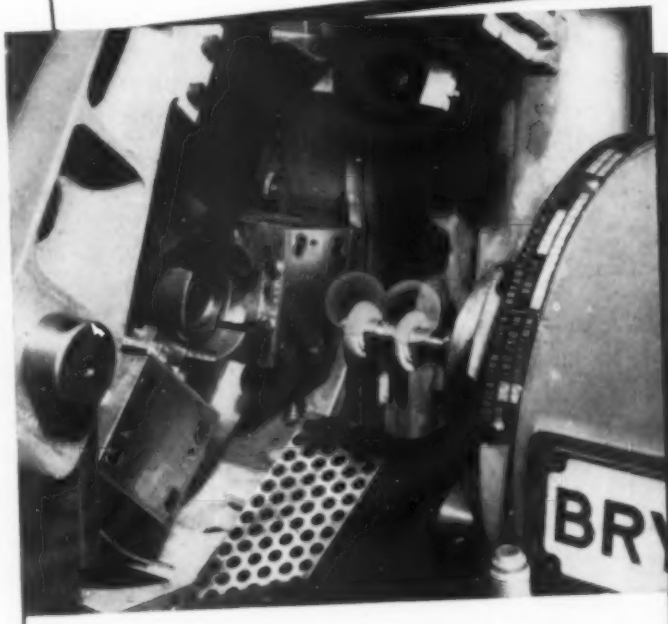
An Unusual Set-Up

Grinding bearing housings with a Norton wheel on a Dumore tool post grinder, mounted on a horizontal boring mill. The grinder itself revolves in a planetary motion, the grinding wheel spindle following the I.D. of the hole. To grind the other end of the housing the work table is turned 180°. *Material:* cast steel. *I.D.:* 7.8737". *Stock removal:* .005" each end. *Limits:* +.0001", −.0004". *Time:* two hours each end



Rounding It Out — Fast

During hardening, a certain amount of warpage occurs in this steel mould band. A Norton wheel is grinding it perfectly round and smooth. The band has an I.D. of 6" and is 4" deep. Average amount of stock removal is .040" and the time cycle is 30 minutes.



Precision Performance — Doubled

Here a Norton two-wheel set-up is ready to go into fast grinding action. The job is grinding a double race in a steering gear bearing. *Material:* SAE 1045 steel, 54 Rockwell C. *I.D.:* 1.1507". *Stock removal:* .012". *Limits:* +.0000", −.0005". *Finish:* 10 microinches RMS.

See Your Norton Distributor

for further facts on how Norton wheels can bring the value-adding, money-saving "Touch of Gold" to your own internal grinding operations. He'll be glad to arrange a test in your plant. Or write direct to your nearest Norton district office. And remember: only Norton offers you such long experience in both grinding wheels and grinding machines. NORTON COMPANY, Worcester 6, Mass. Offices in nine cities. Distributors in all industrial areas — listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated.

NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Pressure-Sensitive Tapes

W-1683

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Circle No. A2 on postpaid card

With Permanent Magnetic Chuck

NEW *Vulcan* MOTORIZED ROTARY TABLE

for lapping and grinding

(not an index table)

With Lapping Plate

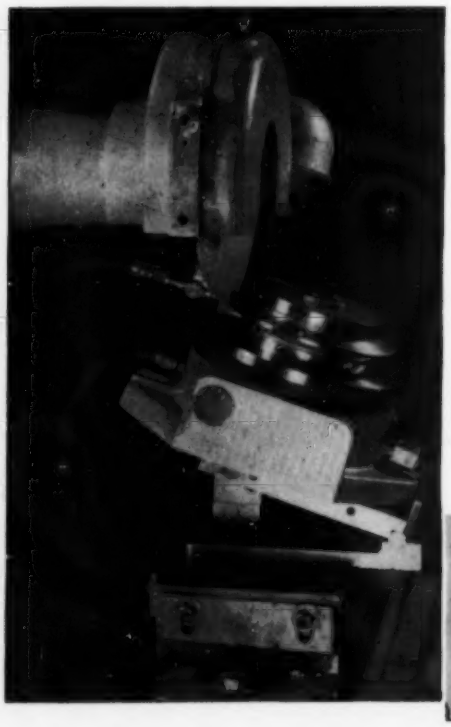
FASTER
circular precision grinding!

Now with this table and with less effort you assure highest standards of accuracy, flatness, finish and close tolerances. At the same time you eliminate slow and complicated tool setups. You cut grinding time greatly by using only cross feed while the table is rotating at infinite speeds between 40 and 100 RPM.

For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6″ and 10″ in diameter.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied — grind flanged studs or bushings — bearing spacers — forming rolls — cutters — convex or concave surfaces — punches or dies (radius or angle).

Lapping? Yes — and in micro inches. For the 6″ and 10″ table, lapping plates of 12″ and 16″ are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. *Write for circular.*



Work clamped to motorized table, mounted on sine plate. Surface grinder application.

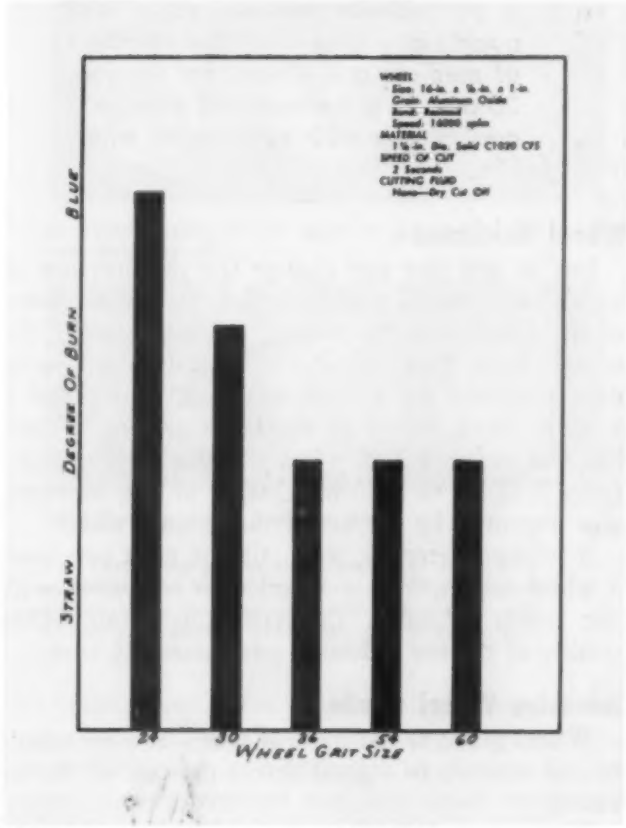
Major Vulcan Services

Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO.

744 LORAIN STREET • DAYTON 10, OHIO

Circle No. A3 on postpaid card



WHEEL
Size: 16-in. x ⅛-in. x 1-in.
Grain: Aluminum Oxide
Bond: Resinoid
Speed: 16000 sfpm

MATERIAL
1⅛-in. Dia. Solid C1020 CFS
SPEED OF CUT
2 Seconds
CUTTING FLUID
None—Dry Cut Off

8. Here it is shown that the coarse grit wheels produce a quality of cut that is inferior to finer grits.

grit affected wheel efficiency very little. However, a change from 36 grit to 54 grit produced a 31% drop in wheel efficiency and a further decrease of 40% occurred when the grit size was changed to 60 grit.

If long life is desired, coarse grit wheels are the proper wheels to use. Figure 8 shows the quality of cut produced with various grit size wheels when cutting solid bar stock. This graph points out that the coarse grit wheels produced a quality of cut that is inferior to the finer grits. As the grit size became finer the quality of cut became better. Quality of cut and wheel life, therefore, oppose each other. If superior quality is desired it must be produced at the expense of wheel life and conversely if long wheel life is desired, quality of cut must necessarily be sacrificed to obtain it.

From the wheel efficiency point of view, it is evident that grit size can change wheel efficiency as much as 80%.

As in most operations involving the use of abrasives a compromise must be effected and in cut-off work these data show that a 30 or 36 grit wheel is a logical compromise between superior quality of cut and long wheel life.

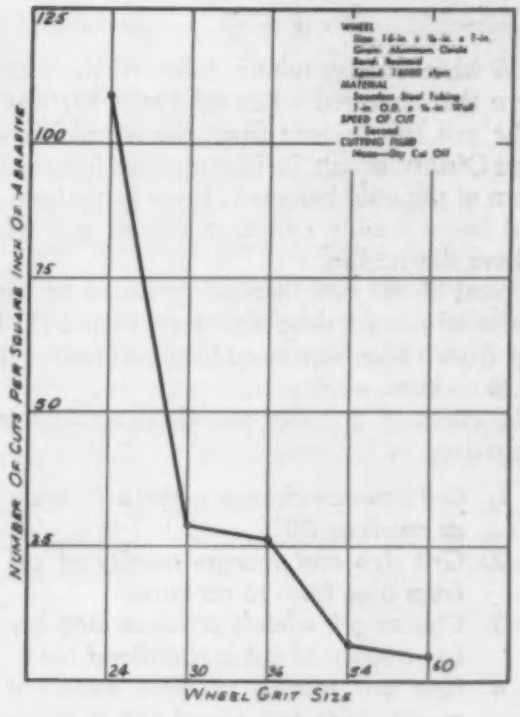
Figures 9 and 10 show the effect of a change in grit size when steel tubing is cut. The major difference between solid steel and steel tubing is the amount of area that is cut off. Two factors are apparent from an examination of Figures 9 and 10. The first is that the wheel efficiency when cutting tubing is much higher than when cutting solid stock of the same diameter. This is logical and reasonable because the smaller area that is cut the less it would wear the wheel. The second factor is that the quality of cut produced by the finer grit wheels is better when cutting tubing than when cutting solid stock. Again this appears logical because of the decreased area and the consequent reduction of heat that is generated.

The effect of a change in grit size on wheel effi-

9 & 10. The effect of change in grit size when steel tubing is cut.

WHEEL
Size: 16-in. x ⅛-in. x 1-in.
Grain: Aluminum Oxide
Bond: Resinoid
Speed: 16000 sfpm

MATERIAL
Seamless Steel Tubing
1-in. O.D.—⅛-in. Wall
SPEED OF CUT
1 Second
CUTTING FLUID
None—Dry Cut Off



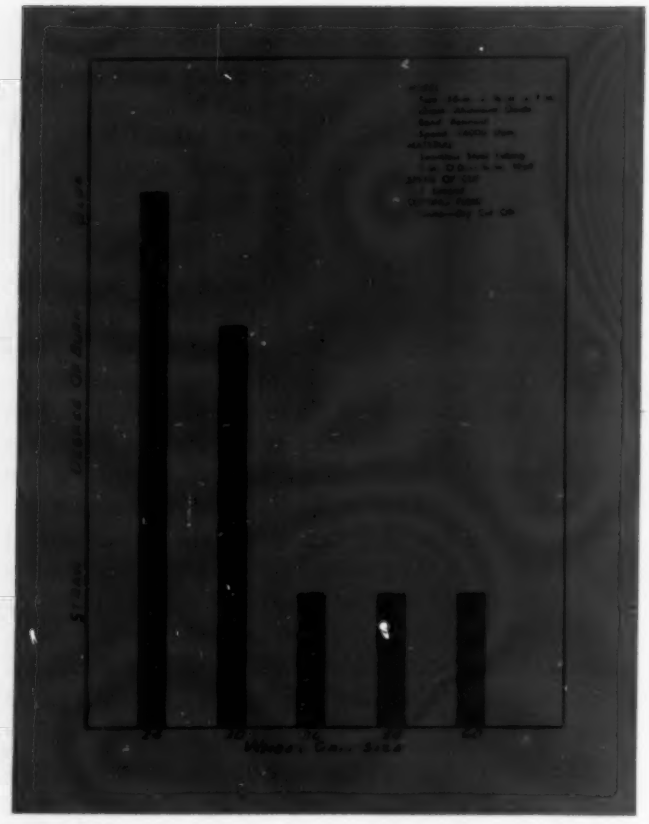


Figure 10.

WHEEL
Size: 16-in. x 1/8-in. x 1-in.
Grain: Aluminum Oxide
Bond: Resinoid
Speed: 16000 sfpm

MATERIAL
Seamless Steel Tubing
1-in. O.D. x 1/8-in. Wall
SPEED OF CUT
1 Second
CUTTING FLUID
None—Dry Cut Off

5. *A compromise between excellent quality and long life is the selection of medium grit wheels for the job. 30 and 36 grit wheels will give good quality cuts with reasonable wheel life.*

Wheel Thickness

Just as grit size can change the performance of an abrasive cut-off wheel so also can the thickness of the wheel alter the cutting characteristics of the wheel. Data Sheet II shows typical performance data produced by a 1/16 in. thick wheel and a 3/32 in. thick wheel in the same grading. Wheel life was reduced 53% when the thickness changes from 3/32 in. to 1/16 in. Quality of cut, however, was improved by the use of the thinner wheel.

It follows, therefore, to obtain the most cuts from a wheel use as thick a wheel as is consistent with the power available. Conversely to obtain better quality of cut use a thinner wheel.

Abrasive Wheel Grade

Wheel grade or hardness of wheel also contribute to and controls to a great extent the cost of the abrasive.

The extent of the control that is exercised by the grade of the wheel is shown on Data Sheet III. These data clearly point out that a change of 2 grades in wheel hardness produced a 37% decrease in wheel life or a 37% increase in abrasive cost. A change from a T grade wheel to a V grade wheel also pro-

continued

ciency, when cutting tubing, followed the identical pattern that appeared when solid steel bar was cut. As the grit size became finer, the wheel life went down. Quality of cut in like manner followed the pattern of the solid bar stock. Finer grit wheels produced better quality cuts than coarser grit wheels, but have shorter life.

Typical of the cuts that are produced by various grit size wheels are those shown on Figure 11. They range from a blue burn to no burn and from a heavy burr to no burr.

The effect of grit size on wheel action may be summarized as follows:

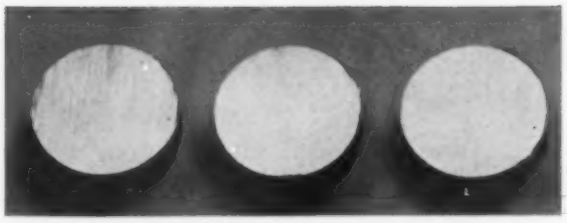
1. *Grit size can change wheel efficiency as much as 80%.*
2. *Grit size can change quality of cut from blue burn to no burn.*
3. *Coarse grit wheels produce long life but quality of cut is sacrificed for it.*
4. *Fine grit wheels produce excellent quality cuts but wheel life is sacrificed for it.*

duced more heat that was reflected in the ability to maintain close parallelism of cut. Obviously then, a harder grade wheel will produce more cuts per wheel but will generate more heat and impair the quality of the cut. While these data reflect what happened in one situation and may not be used as a general indication of what may happen in a different situation, they definitely point out that wheel grade and wheel cost are related very closely to a great extent.

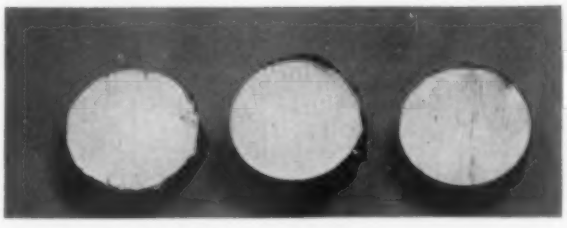
To select the optimum wheel grade for any one job is relatively easy. To generalize on wheel selection, however, is more difficult because of the many factors that affect the selection of an optimum wheel grading. These factors include such things as:

1. Type of material.
2. Area of material.
3. Production requirements.
4. Power available on the cut-off machine.
5. Condition of machine spindle and bearings.
6. Quality of cut required.

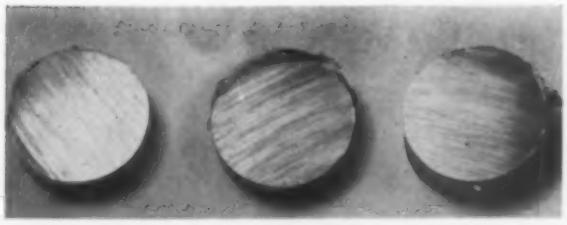
How the type of material, the rate of cut and the



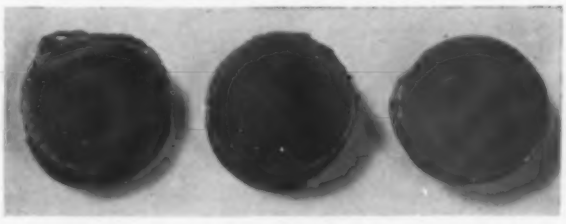
Excellent quality. Slight burr; no burn. Fast cut with fine grit wheel.



Good Quality. Light burr; no burn.



Medium quality. Medium burr; trace of burn.



Poor quality. Heavy burr; blue burn. Slow cut with coarse grit wheel.

11. These four photos show quality of work done as speeds and/or grit sizes are varied. Excellent quality when fast cut is made with a fine grit wheel; poor quality when slow cut is made with coarse grit wheel, etc.

available power affect wheel performance have already been outlined in the preceding portion of this article. With this as a background, there are a few general conclusions that may be resolved concerning the choice of a wheel grade. These are as follows:

1. *When cutting hard materials use soft grade wheels.*
2. *When cutting soft materials use hard grade wheels.*
3. *When cutting large areas use soft grade wheels.*
4. *When cutting small areas use hard grade wheels.*
5. *When using low powered machines use soft grade wheels.*
6. *When using adequately powered machines use hard grade wheels.*

Data Sheet I. Rate of Metal Removed at Each Time of Cut

MACHINE: Campbell Cut Off
WHEEL SIZE: 16 in. x ⅛in. x 1 in.
WHEEL SPEED: 16000 sfpm
MATERIAL CUT: 1-⅛ in. Diameter C1020 CFS
TIME PER CUT: 2 seconds
NUMBER of Cuts: 25
CUTTING FLUID: None - dry cut off.

Conclusion

From all these data that were compiled under controlled conditions, the following factors will direct the way to optimum cut-off wheel efficiency and enable users of abrasive cut-off wheels to reduce their costs and improve their operation. These factors are:

1. Operate wheel at manufacturer's recommended speed.
2. Maintain constant wheel SFPM.
3. Provide adequate horsepower on all cut-off machines.

10 in. wheel—minimum of 3 horsepower
16 in. wheel—minimum of 7.5 horsepower
20 in. wheel—minimum of 10 horsepower

A rough approximation of horsepower required is 1/3 hp for each square inch of steel cut per minute.

4. Select the abrasive cut-off wheel according to the requirements of the operation:

a. For long life use coarse grit wheels.
b. For superior quality of cut use fine grit wheels.
c. To cut large areas use soft grade wheels.
d. To cut small areas use hard grade wheels.
e. To cut hard materials use soft grade wheels.
f. To cut soft materials use hard grade wheels.
g. A wider wheel will produce longer life, generate poorer quality and require more power.
h. A thinner wheel will produce shorter life, generate superior quality and require less power.

Time of Cut Seconds	Square Inches Cut Per Minute	Horsepower Consumption	Horsepower Required to Cut 1 Square Inch Per Minute
1	60	17.7	.295
2	30	9.6	.320
3	20	8.6	.430
6	10	3.8	.380

5. Recognize that production rate, available power and abrasive costs are directly related.

Production Rate	Available Power	Wheel Grade	Abrasive Costs
High	Inadequate	Soft	High
High	Adequate	Hard	Low

6. Realize that total cost consists of abrasive cost and labor cost together with time of cut and quality of cut.

Total Cost	Labor Cost	Abrasive Cost	Abrasive Life	Quality of Cut	Time of Cut
Low	Low	High	Low	Good	Fast
High	High	Low	High	Poor	Slow

Data Sheet II. Performance of 1/16-in. Wheel and 3/32-in. Wheel

MACHINE: Delta Cut Off
WHEEL SIZE: 10 in. diameter
WHEEL SPEED: 4000 rpm
MATERIAL CUT: ½ in. diameter C1020 CFS
TIME PER CUT: 1 second
NUMBER of Cuts: 50
CUTTING FLUID: None-dry cut off.

Wheel Grading	Wheel Thickness Inches	Diameter Loss Inches	No. of Cuts Per Sq. Inch Abrasive	% Change
36 Grit "ALO" Resinoid	.103	.099	32.1	53
36 Grit "ALO" Resinoid	.067	.187	17.1	100

Data Sheet III. The Effect of Wheel Grades on Cost

MACHINE: Campbell Cut Off
WHEEL SIZE: 16 in. x ⅛ in. x 1 in.
WHEEL SPEED: 16000 sfpm
MATERIAL CUT: 1-⅛ in. diameter C1020 CFS
TIME of Cut: 2 seconds
NUMBER of Cuts: 25
CUTTING FLUID: None - dry cut off.

Wheel	Wheel Thickness Inches	Diameter Loss Inches	No. of Cuts Per Sq. Inch Abrasive	% Change	Maximum Out Of Parallelism Inches
"ALO" Resinoid T Grade	.128	.570	1.76	100	.006
"ALO" Resinoid V Grade	.126	.361	2.76	63	.010

Air Powered Portable Belt Grinder

Photograph shows the universal air powered portable belt grinder which was recently developed and placed on the market by Abrasive Machine Corp., 432 S. Pennsylvania St., Indianapolis, Ind.

This belt grinder can be used as a standard portable belt grinder by using the contact wheel, and is capable of grinding light weld beads, solder joints, deburring large parts and performing polishing operations.

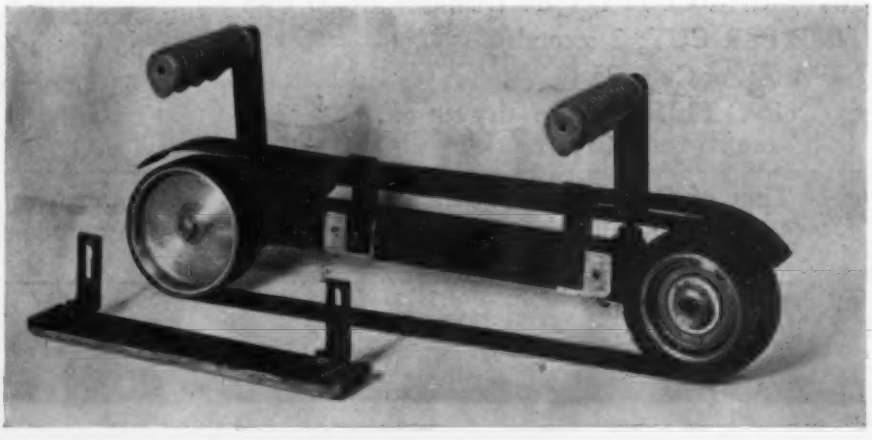
Slack-of-the-belt can be utilized for polishing contoured parts. When the platen is mounted, flat grinding operations can be performed.

The grinder has a lathe mounting for mounting from the back cross slide for polishing cylindrical parts. It may also be bench mounted for off-hand grinding, polishing and deburring on the contact wheel.

The handles, guard and platen are all reversible to make either a right-hand or left-hand grinder.

The belt is powered from a 1½ hp air motor. The standard 1½ hp grinder is furnished to use 1½" wide x 42" long, and 2" wide x 42" long abrasive belts. •

Use HANDY Postpaid Card. Encircle No. 101



There's an EX-CELL-O

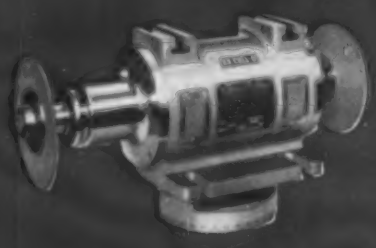
Precision Spindle

BUILT ESPECIALLY FOR YOUR WORK

Single-body, belt driven internal grinding spindle.

15 hp heavy duty precision spindle with 24" grinding wheel.

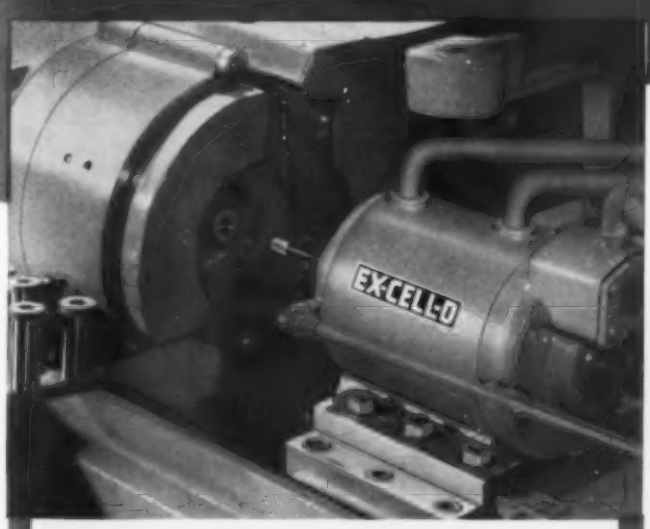
25,000 rpm high frequency inbuilt motor spindle.



Precision inbuilt motor spindle for cutter grinder.

Totally enclosed inbuilt motor surface grinder spindle.

Heavy duty motorized precision spindle available up to 20 hp.



EX-CELL-O High-frequency Spindle, rated at 40,000 rpm, grinds small holes in bushings.

XLO

EX-CELL-O for PRECISION

For production grinding to precision limits "just any spindle" won't do. It must be carefully selected to suit the work. From Ex-Cell-O's widely-varied line of precision spindles you can select a standard model, or we'll make one special to your requirements. These spindles have long been the original equipment choice of leading manufacturers.

Features of the line include:

Rigidity
Permanent adjustment
No vibration, no chatter
Precision ball bearings preloaded for predetermined speeds

Phone your Ex-Cell-O representative, or phone or write Ex-Cell-O in Detroit, for CATALOG LISTING HUNDREDS OF STANDARD GRINDING SPINDLES

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Encircle No. 214 on postpaid card

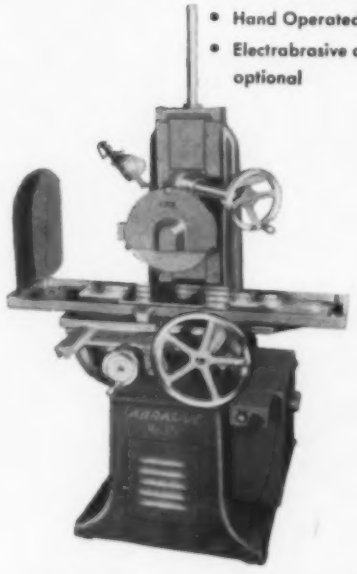
56-32

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

Man, oh, man
ABRASIVE!
A typical topper from the trade . . . from "slickest, smoothest, easiest . . . to most accurate, most convenient, most value!"
It's easy to see why. Abrasives turn precision grinding into an effortless pleasure for the man who prides himself in the finest, most accurate work.
In tool rooms, shops, and production lines, Abrasives exceed the heaviest demands. Company management appreciates Abrasive's sensible economy. Production management can count on speed, precision accuracy — plus — easy, infrequent maintenance. And most important, machinists, tool makers and mechanics, from masters to apprentices, enjoy Abrasive's simple, tireless operation and easy accuracy.
Here's the ABRASIVE LINE . . .

No. 1½ Surface Grinder
10" x 15" x 12"

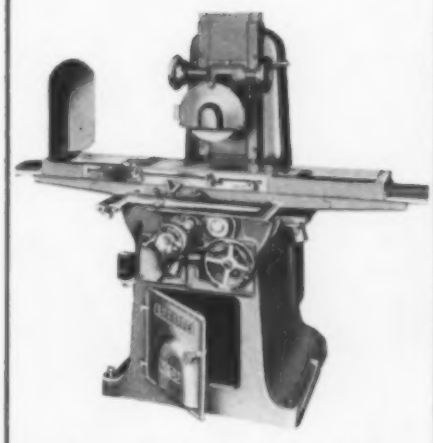
- Hand Operated
- Electrabrasive control, optional



The biggest little grinder for the money.

No. 3B Surface Grinder
8" x 24" x 12"

- Automatic or manual feed
- Power or belt-driven spindle



For production and toolroom grinding.

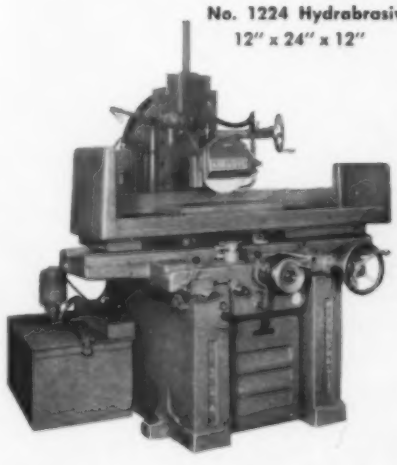
No. M34 Surface Grinder
8" x 24" x 12"

- Automatic feed
- Vertical spindle

Fast, economical for high production.

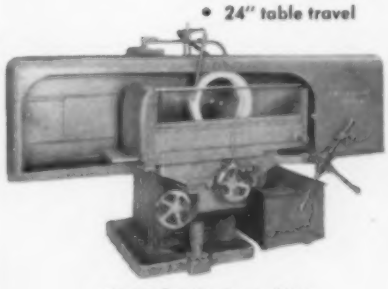
The ABRASIVE line...engineered for accuracy, speed, economy, ease of operation!

No. 1224 Hydrabrasive
12" x 24" x 12"



No. 18 Face Grinder
18" Wheel

- Motorized spindle
- 24" table travel



Finest for Castings, Dies, Ceramics, Flat Surfaces

NEW ABRASIVES COMING

This new name plate gives you a hint! This year, look for new machines, new ideas, new developments from Abrasive.

The Hydrabrasive 1224, plus Hydrabrasives 824 and 1218 (not shown) are hydraulically operated for smooth, easy, vibrationless operation. Hydraulic units are rubber mounted on casters for effortless removal through the front of the machines. For the heaviest grinding loads, all have rugged motorized spindles. Abrasive's precision screw feed and ball bearing saddle ways assure precise transverse adjustment, absolute accuracy. These features, plus automatic feeds and simplified controls have made the Hydrabrasives first choice of thousands.

YOURS FREE!

Fully illustrated catalogs describing the complete Abrasive precision surface grinder line, including machines not illustrated here. This information is yours for the asking. Your name and address on a two-cent post card will bring this colorful new literature to you by return mail.

For Forty Years . . . First for Accuracy, Economy

ABRASIVE

ABRASIVE

Machine Tool Company

East Providence, Rhode Island

Encircle No. 215 on postpaid card

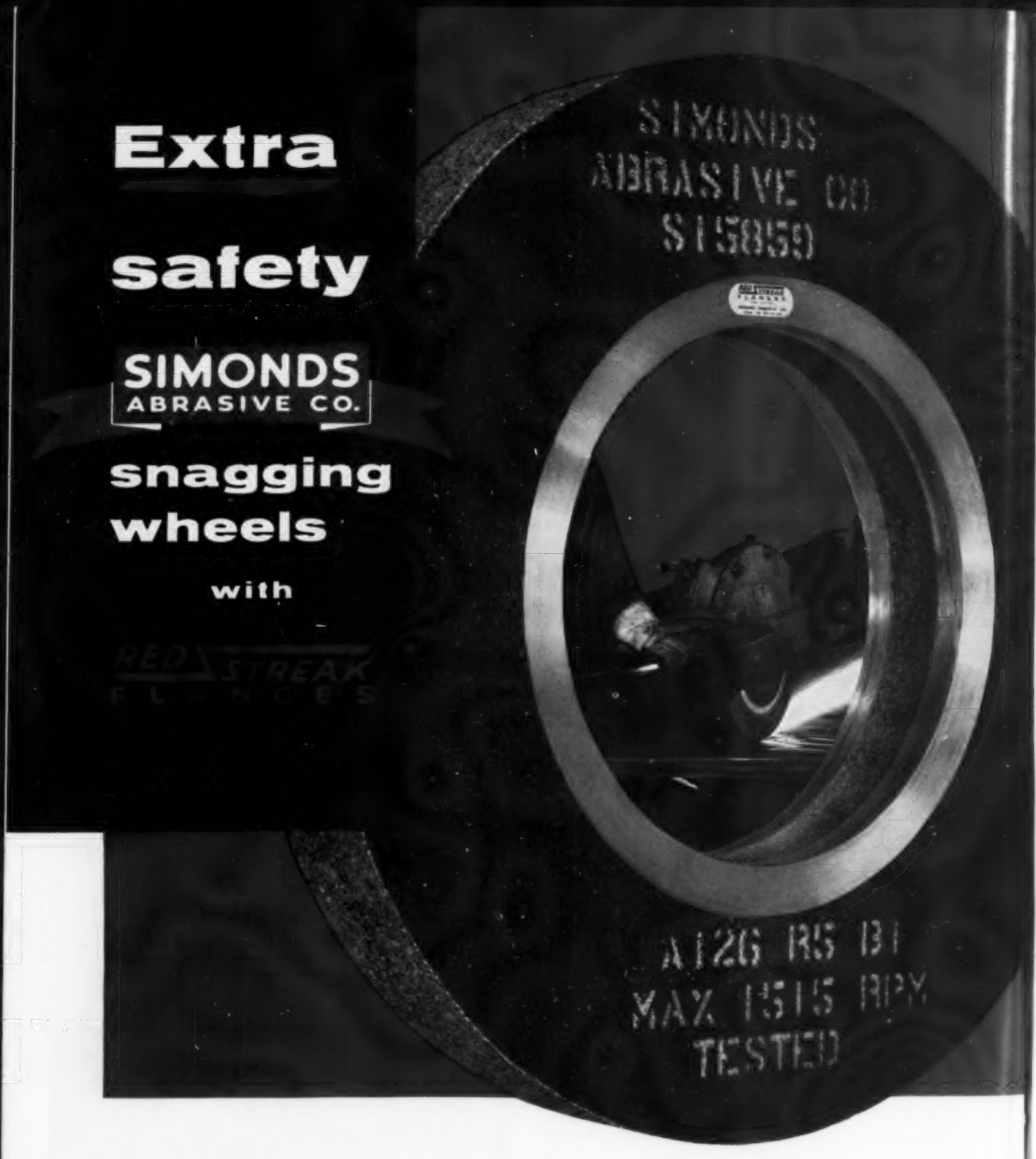
Extra safety

SIMONDS ABRASIVE CO.

snagging wheels

with

RED STREAK FLANGES



Strong, high-speed resinoid bonded wheels with built in circular steel flanges. Exceptional for fast stock removal, long wheel life and extra protection against radial cracking. Easy to mount. Accurate balance, true running for superior grinding action. In 6″, 10″ and 12″ hole sizes. Send for bulletin ESA—62.

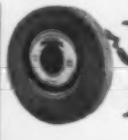
Encircle No. 216 on postpaid card

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities

Division of Simonds Saw and Steel Co., Fitchburg, Mass.

CALL YOUR SIMONDS DISTRIBUTOR



LOCAL STOCK
FAST SERVICE

1. Plug gages are lapped by the centerless principle; two rolls are run at the same speed parallel to each other. The cylindrical plug gage is placed between the revolving rolls and pressed down with a notched fibre stick.

- √ keep all phases of lapping operation clean
- √ quality of finish depends on abrasive and cleanliness
- √ speed of lapping depends on coarseness of abrasive and pressure
- √ rough lapping is usually done with kerosene, finish is done dry
- √ if lapping with surplus compound the gage will lap undersize and become out of round
- √ roundness of the gage is determined by the initial grinding operation
- √ stock allowed for finish lapping should be no more than .0002-in. to .0003-in.

Gage Lapping Requires Skill and Patience

By **John D. Minton, Manager**
Besly-Metro Division
Besly-Welles Corporation
Beloit, Wisconsin

● Easy as it may appear to the casual observer, gage lapping is, in reality, one of the finer industrial arts. The high degree of precision and the rigorous standard of finish demanded of quality gages leave no room for the unskilled amateur. The procedures we use at Besly-Welles will produce gages of the highest quality only in the hands of highly skilled, experienced personnel, who are surrounded with the conditions and facilities basically necessary for professional gage production.

Plain cylindrical plug gages account for most of the industrial gage lapping today and the principles and practices used are applicable to ring gages and flat gages, though different equipment is used in each case. These gages are hand lapped because no machine has yet been devised that will produce gages to the dimensional accuracy of plus or minus ten-millionths of an inch as is commonly specified for master gages. Hand lapping also produces the flawless finish necessary for precision measurement; or at least it will produce a flawless finish if the proper procedures are followed.

One of the most important requirements is that all phases of the lapping operation be kept clean; no loose dirt or chips can be allowed to get onto the laps or in the lapping compound; gages should be thoroughly cleaned before lapping is started and all lapping should be done in a controlled filtered atmosphere at 68°F., which is the standard measuring temperature in the United States.

Centerless Lapping

The simplest method of lapping plug gages is to use the centerless principle; two rolls are run at the same speed parallel to each other, one roll being about twice as large as the other, the large roll being charged with a lapping compound. The cylindrical plug gage is placed between the revolving rolls and pressed down with a notched fibre stick which is

2. Special equipment for precision grinding, prior to lapping, should be used to produce high quality gages economically. This grinder is equipped with a time-cycle dwell control and is used to produce a number of gages of like size.

used to guide the gage lengthways across the lapping rolls, figure 1.

Both rolls are run in the same direction and the difference in surface speed between the large roll and the small roll sets up a rapid lapping operation which very quickly removes the rough grinding marks from the gage. The quality of finish obtained depends upon the fineness of the abrasive and the cleanness of the lap roll. The speed of the lapping process depends upon the pressure applied and the coarseness of the lapping compound, although grit size coarser than 300 is usually too rough for gage lapping. A finer lapping compound of about 900 to 1200 grit is used to charge the finishing roll.

A centerless type machine has two sets of rolls in line, the first set is charged with coarse roughing compound, and is usually made of fine grain soft cast iron. The second set can be either cast iron or copper and is charged with the fine finishing compound. Rough lapping on the first set of rolls is best done with kerosene as a lubricant and vehicle for the abrasive. Finish lapping on the second set of rolls is usually done almost dry in order to produce a high luster finish. It is important here, as in all lapping, that abrasive be used sparingly and charged into the roll laps and not be allowed to accumulate on the surface as a "sludge." If surplus compound is present when lapping, the gage will lap undersize at the ends and become out of round and "barrel" shaped. It is necessary to keep the rolls clean, washing them free of grease and gum with a solvent when they become loaded and no longer cut freely.

Lapping Compounds

Let it be now stated clearly; there is no mystery or secret formula concerning lapping compounds or abrasives. Any clean, hard, sharp abrasive, accurately graded can be applied to any lap that is softer than the work to be lapped and can be used as a dry flour, carried in a paste or mixed with oil or kerosene as a vehicle and cutting lubricant.

Each lapper usually develops a private pet compound of his own that might contain anything from snake oil to buttermilk, but the chief ingredient always is diligent and persistent effort applied with a great patience. To achieve dimensional precision as well as fine finish, the lapping rolls must be round, straight, and without nicks or scratches on their surfaces. The gages themselves must be processed for precision from the selection of the steel to the finish inspection. A high grade, stable, non-deforming electric furnace steel of fine, even grain structure is necessary to eliminate "wildness" or a tendency to warp and swell in processing. After hardening all gages should be stabilized by freezing for 48 hours at -120° F., this "ages" the steel and prevents subsequent "growth" after the gage is finished.

Grinding Before Lapping

Grinding before lapping is also a precision operation as the roundness of the gage is determined in the grinding, the roll laps themselves can do nothing to correct an out of round condition. The pin type

3. A precision grinder equipped with B & S's Electralign taper control device which allows an inexperienced operator to eliminate taper in just one setting. The author, John D. Minton, is pointing to the Electralign device.

or reversible gage which usually has no centers and is centerless ground before lapping, is quite often slightly triangular in shape. If the error is greater than the finished gage tolerance for out of roundness the gage must be lapped with a ring to restore roundness before proceeding with roll lapping for finish sizing.

Gages that are ground between centers are usually free from out of round trouble, providing the centers are carefully lapped, but special equipment for precision grinding should be used to produce high quality gages economically. The machine shown in figure 2 is the new B & S No. 1 precision grinder equipped with a time-cycle dwell control that is used to produce a number of gages of like size. Figure 3 is a B & S No. 5 precision grinder equipped with the new Electralign taper control device which allows an inexperienced operator to eliminate taper in just one setting. When used on short run job work which is the usual thing in gage work, not only is grinding time reduced but lapping time is no longer wasted in straightening out taper conditions which can be overcome by good precision grinding. Stock allowed for finish lapping should not be greater than .0002 in. to .0003 in. if lapping time is to be kept to the minimum.

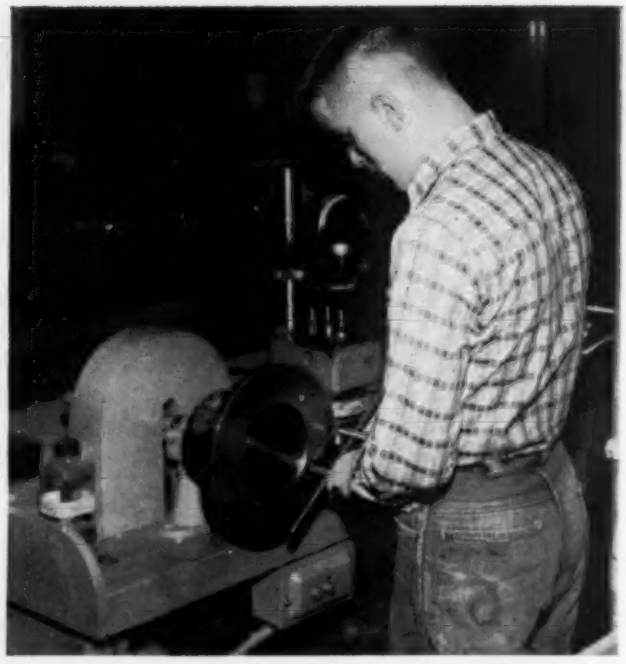
Lapping on Rotating Discs

Where gages are ground between centers another method of lapping can be used as shown in figure 4 which is a flat cast iron disc or plate revolving in a slow variable speed head and charged with lapping compound. The gage is mounted in a light pair of hand centers and allowed to revolve against the rotating disc which laps the gage at a rate dependent upon the coarseness of the compound and the pressure exerted. By holding the gage slightly above or below the center of the disc a helical lapping action is developed which produces a finer and more lustrous finish than is usually produced by roll lapping previously described. Once again the finishing must be done on a disc that is dry and charged only with the finest compound. The disc must also be flat, without surface blemishes and kept free of gum and sludge.

Where many gages of identical size are required, the use of two large round lapping plates, one which is stationary suspended above the revolving lower plate is found to produce a high quality finish and good accuracy in the hands of a competent and experienced operator. As supplied by the Norton Company this machine produces an oscillating differential lapping action when the gages are held between centers in a work holding fixture of proper design. About six pieces is the least number that can be economically produced by this method; as the number increases dimensional control and the cost factors improve to where large quantities should be lapped on this type of equipment only.

Expansion Cylindrical Lap

Ring gages can be roughed out by the use of honing machines using abrasive stones, but the best finish and dimensional control results from the use of a fine grained cast iron expansion cylindrical lap, which should be mounted on a precision tapered arbor and lightly charged with the proper lapping compound. The lap should be at least 50% longer



4. Where gages are ground between centers another method of lapping can be used. This consists of a flat cast iron disc or plate revolving in a slow variable speed head and charged with lapping compound.

than the ring to be lapped and should be precision ground to fit the gage without play or wobble. The fit between the lap and gage should be maintained by tapping lightly on the end of the lap with a wooden or plastic mallet. A light oil or kerosene should be used to prevent galling, the final finish being produced by wiping the lap dry for the last few strokes of the slowly revolving lap. Fresh lapping compound can best be introduced at the center of the lap and allowed to work outwards towards the ends of the ring gage in order to prevent the tendency to bellmouth, which is the hardest task in ring gage lapping.

Flat lapping of plain surfaces such as snap gages and length and height blocks is easily accomplished on a flat cast iron plate which is cross-scored for roughing but does better finishing when plain and smooth. Again the best finish is produced when the charged cast iron plate is kept clean and used dry and is not overloaded with loose abrasive. Where the work cannot be held flat on the plate a suitable block or fixture must be devised so that the part will not rock or tip while being lapped.

The foregoing brief description of gage lapping, where dimensional control is the major aim, is of course, distinctly different from the art of polishing where surface finish is the main objective and size is not critical. It is impossible to explain the multitude of sensitory skills developed by skilled lappers after years of experience; the ability to tell by sound the amount of metal removed in a given time, to tell by feel how much more must be removed to produce a perfect finish; and only they can look deep into the lustrous perfection of a finished gage and know that their work is good. • • •

DISTRICT MANAGERS

GRINDING and FINISHING

EASTERN DIVISION
Dan E. Reardon, V.P., c/o Hitchcock Publishing Co.
55 West 42nd Street
New York 36, N.Y.
Telephone: LAckawanna 4-4528

NEW ENGLAND, EASTERN N. Y. STATE
Dan E. Reardon, V.P.
Box No. 1, South Glastonbury, Conn.
Telephone: MEdford 3-7083

John Pickering
Box 148, c/o Hitchcock Publishing Co.
North Andover, Mass.
Telephone: LAwrence 8-0913

NEW YORK, METROPOLITAN AREA
Martin J. Gallay, Raymond J. Sietsema
c/o Hitchcock Publishing Co.
55 West 42nd Street
New York 36, N.Y.
Telephone: LAckawanna 4-4528

EASTERN PENNA., CENTRAL N.Y. STATE, N.J., MD., DELAWARE, DISTRICT OF COLUMBIA, BROOKLYN, N.Y.
Raymond J. Sietsema, c/o Hitchcock Publishing Co.
55 West 42nd Street
New York 36, N.Y.
Telephone: LAckawanna 4-4528
Home Phone: VErona (N.J.) 8-7520J

CENTRAL DIVISION
Henry J. Smith, V.P., c/o Hitchcock Publishing Co.
222 East Willow Avenue
Wheaton, Illinois
Telephone: WHeaton 8-3400

INDIANA, WESTERN OHIO, KENTUCKY
Henry J. Smith, V.P., c/o Hitchcock Publishing Co.
222 East Willow Avenue
Wheaton, Illinois
Telephone: WHeaton 8-3400

MICHIGAN, NORTHERN INDIANA, TOLEDO, OHIO
James C. Stewart, V.P.
18055 James Couzens Highway
Detroit 35, Michigan
Phone: DI 1-9525 (Diamond)

ILLINOIS, WISCONSIN, IOWA, MINNESOTA, MISSOURI
Robert G. Bolinder, Marvin Matson
c/o Hitchcock Publishing Co.
222 East Willow Avenue
Wheaton, Illinois
Telephone: WHeaton 8-3400

WESTERN N.Y. STATE, WESTERN PENNA., EASTERN OHIO
Ralph E. Helfrick
1507 Edgefield Road
Cleveland 24, Ohio
Telephone: HIllcrest 2-0189

WESTERN DIVISION
CALIFORNIA, ARIZONA
Keith H. Evans
3723 Wilshire Boulevard
Los Angeles 5, California
Telephone: DUnkirk 8-2981 and
593 Market St., Room 304
San Francisco 5, California
Telephone: YUkon 2-4280

OREGON, WASHINGTON
Lloyd Thorpe, 531 Medical Arts Building
Seattle 1, Washington
Telephone: MAin 6827

HITCHCOCK PUBLISHING CO.
Telephone WHeaton 8-3400
Wheaton, Illinois

High-Speed Spindle Mounting Assures Accuracy at High Operating Speeds

Machine tool manufacturers are producing grinders with ever higher spindle speeds and greater accuracy. High speeds and the commensurately higher temperatures present a special problem to both bearing manufacturers and machine tool builders.

Obviously, spindles turning at high rates of speed heat up. In doing so, the spindle expands radially as well as axially. Consequently, on a spindle with the bearings mounted cone adjusted, a given distance apart, these bearings will expand radially and tend to tighten more rapidly than the spindle can expand axially and tend to loosen the bearing adjustment.

Timken Roller Bearing Company engineers and researchers, after years of study and experimentation, recently came up with a solution to the problem created by spindle heat and high spindle speeds. Timken engineers knew that in order to take care of the short period of time during which the radial and axial expansions took place, it was necessary to give the bearings on the spindle a chance to breathe or expand radially and thus prevent the excessive preload which might develop. This period of time, of course, is that period between the time of starting the machine and the time it gets up to operating temperature.

After prolonged testing, the Timken laboratories proposed the use of the "high-speed spindle mounting" as a means of obtaining the best all round results.

In the "high-speed spindle mounting," the front bearing is mounted on the spindle and directly in the headstock of the machine. The rear bearing cup is mounted in an adaptor. The O.D. of this adaptor should be finished after the cup is pressed in place. The land directly above the cup should be made from .001 to .004 smaller in diameter than the bore in the headstock depending upon the size of the bearings involved. The other end of the adaptor should be made from .001 to .002 larger in diameter than the bore of the headstock so that a press fit can be obtained. A relief should be provided in the adaptor between the fitted portion and the unsupported land.

In operation, as the bearing temperature rises, the rear bearing and adaptor expand radially taking up the slight clearance between the adaptor and the headstock bore. In so doing, both front and rear bearings are relieved from extreme preload and consequently failures due to excessive tightness and temperature are eliminated.

In a test group of high-speed spindles, engineers equipped spindles with different types of bearings as well as eight spindles with the Timken "high-speed spindle mounting." All of the spindles are grease-lubricated. It was found that the Timken bearing equipped spindles showed more rigidity, which allowed faster stock removal and produced better finish than either of the other spindle designs. On one of the Timken bearing equipped spindles a life of over 12,500 hours was obtained. The average life of all eight Timken bearing equipped spindles was 3,012 hours. This compared with an average life of 1,638 and 2,070 hours life on the two spindle bearings tested. • •

Incentive Program Successful At Electro Refractories

Maintenance crews, as well as production workers, can enjoy the benefits of incentives programs.

That's the experience at Electro Refractories & Abrasives Corp., where maintenance men are earning as much as 25 per cent over base pay. Carl F. Leitten, executive vice president, says they have appreciably reduced down time and improved machine methods.

Under the plan, maintenance supervisors and the standards department work together to establish fair credit hours for getting jobs done. If this time is bettered, the maintenance men get credit hours. On the other hand, the men are debited whenever a machine breaks down.

Lapping For Precision Flatness and Parallelity in Production Quantities

...with a LAPMASTER

This is the machine for you if you want precision flatness in production quantities at low cost. Lapmasters readily lap to the extreme close tolerance of one light band (.0000116") or less. In addition they produce an extremely fine finish to as low as 1 RMS. They are available with 12", 24", 48", 72" or 84" lapping plates.

THIS IS HOW THE LAPMASTER WORKS

I, a heavy cast iron lap plate revolved slowly under power. II, large cast iron conditioning rings are held in position and rotate freely on the lap. III, work pieces are placed inside the conditioning ring where they also rotate on the lap. IV, a liquid vehicle containing fine loose abrasive flows on the lap plate and is uniformly distributed under the work pieces. At the same time the rotating conditioning rings preserve the flatness of the lap plate. These three essential features, combined with the rapid cutting action of loose abrasive produces a flatness which meets every production requirement.

1 Operator requires no previous lapping experience.
2 Lapping with loose abrasive and without excessive pressure eliminates heat and subsequent distortion.
3 Simplicity of design provides accessibility and allows ease of loading and unloading.
4 Loose abrasive distributed evenly over lapping area insured uniform results.
5 Precision laps identical parts in one cycle or parts of various shapes, heights and materials in one cycle.
6 Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

CRANE PACKING CO.
6417 Oakton St., Morton Grove Ill., (Chicago Suburb).
In Canada: Crane Packing Co., Ltd., Hamilton, Ont.

CRANE PACKING COMPANY

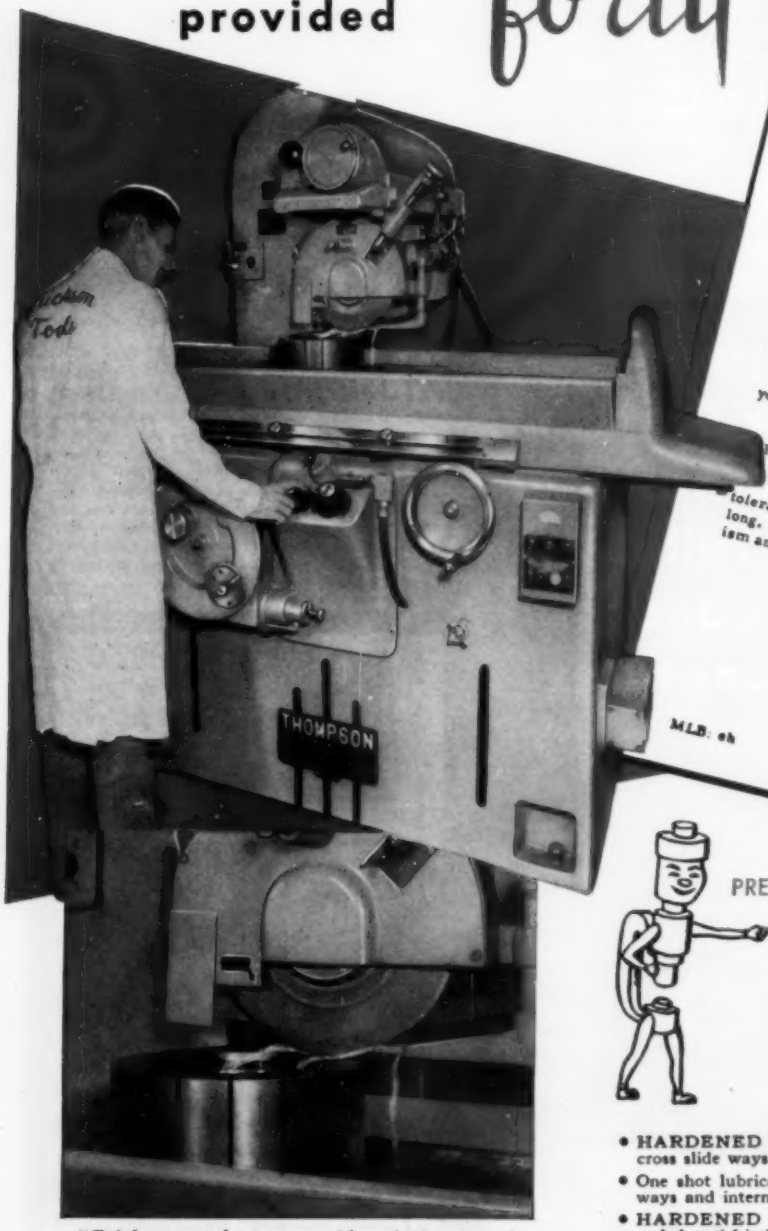
Encircle No. 217 on postpaid card

The Erickson Tool Company

asked for at least .0001 for parallelism and size. . .

The Thompson 2F (8x10x24) Super Precision Grinder

provided "forty millionths"



ERICKSON TOOL COMPANY
EAST 83rd AND HAMILTON AVENUE
CLEVELAND 14, OHIO

September 17, 1954

The Thompson Grinder Company
Springfield, Ohio

Attention: Mr. John Wilson,
Vice President.

Gentlemen:

May we take this opportunity to express our satisfaction with your Thompson 2F 8 x 10 x 24 Surface Grinder.

We purchased this grinder on your claim of .0001 for parallelism size. This tolerance is necessary for most of our work.

Upon its arrival we asked a service man to prove this .0001 tolerance, using 5 blocks on a surface of 4 inches wide by 20 inches long. The test blocks showed .00004 (forty millionths) for parallelism and size. This was well within your guarantee.

Yours truly,

ERICKSON TOOL COMPANY

M. L. Benjamin,
President.

MLB: eh

PRECISION PETE says:

"You may be surprised to find that Thompson 2F Grinders cost less than some others and still provide all these features for greater accuracy and longer service. Fast delivery, too!"

"Erickson products are sold and guaranteed to hold extreme accuracy. It is vital that we have the precision equipment necessary to manufacture these products. Our Thompson 2F Grinder delivers this precision. In the above picture we are grinding a #1200 expanding sleeve and hold within .0001 parallelism and size."

- **HARDENED AND GROUND** cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- **HARDENED AND GROUND** sealed anti-friction vertical slide.
- **HARDENED AND GROUND BED WAYS** with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.
- Handy control panel.
- Elevation micrometer stop graduated in .0001"
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand feed with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".

Call, write or wire for estimate

Thompson Grinders

THE THOMPSON GRINDER COMPANY • SPRINGFIELD, OHIO

Encircle No. 218 on postpaid card

CENTERLESS Grinding

Part 5, Causes and Cures of Faulty Grinding
Coolants
Truing & Dressing Wheels

Prepared by the Editorial Staff of Grinding and Finishing

WHEN a work-piece that has been ground by the centerless method turns out to be faulty as to shape, dimension or surface quality it is customary, but erroneous, for the shop to blame the wheel. Actually, the trouble may be properly traceable to either the wheel or the machine.

Standard grinding wheels are made to such amazingly close limits as to grade, grain size and structure, that it is easy for a manufacturer to supply the exact wheel required. When a wheel does not perform to the shop's satisfaction it is practically certain either that the wrong wheel was specified, or that something is wrong with the conditions under which it is used.

It is equally certain that the grinding machine maker is not knowingly going to ship a faulty grinding machine. If faulty grinding is ultimately traced to the machine, the trouble will practically always be found to lie in wrong installation, improper maintenance, or incorrect set-up.

Inasmuch as vibration is a frequent source of trouble, particular care should be taken from the outset, when installing a new machine, to see to it that conditions of eventual operation are made as nearly perfect as possible.

Before installing the centerless grinder pay particular attention to the foundation. This should be solid, level, vibration-free, and where possible independent of the rest of the floor. It is suggested that this foundation be made of reinforced concrete at least 6 inches thick. If it is not feasible to have an entirely independent concrete pad, the foundation at least should be thoroughly insulated against other vibration.

When installing the machine, first use kerosene to clean off the slushing compound and any dust or dirt that may have accumulated in transit, taking care that the kerosene is not allowed to remain and displace the lubricant in the slides and bearings. After being thoroughly cleaned, the machine is then ready to be placed on the foundation.

Using a precision machine level, check for level across the length, width, and diagonal of the workrest subbase, the work rest having been removed before shipment. When accurate level has been obtained, tighten the lock nuts on the leveling screws in order that true level may be maintained.

Coolants

Regardless of how accurately a wheel is selected for a job it cannot give top performance unless it is used with the proper coolant in adequate volume. To be wholly satisfactory for centerless grinding, the coolant should have the following qualities:

1—Cooling action. It is not enough to keep work temperature low. In grinding to such close tolerances as are often necessary in centerless work, it may be much more important to keep the work temperature uniform than low. Rises in temperature will cause the work to expand sufficiently to result in under size and might require rejection. The temperature should be room temperature. This requires the use of large quantities of coolant—five gallons per inch of wheel face per minute is often used.

How important coolant is in holding to close tolerances is exemplified in the fuel injection plunger job described in the first article of this series, where limits of $\pm$ .000005 in. for size were specified, and $\pm$ .0000035 in. achieved, at a production rate of 600 per hour. So disastrous could minute changes in temperature be that the temperature of the coolant was regulated within very small limits by means of a thermal control device installed in the coolant reservoir.

2—Low surface tension, to permit the rapid setting of dirt, abrasive particles and chips.

3—Transparency. Permitting the operator to have a clear view of the contact point between grinding wheel and work. This is of special importance in infeed grinding or when grinding to a shoulder.

4—Harmless to bond. This is especially important in centerless grinding because all regulating wheels are of rubber bond which can be damaged by some oil coolants. There are available special coolants having only a slight effect on rubber bond wheels.

While most centerless grinding wheels are of vitrified bond, unaffected by any coolant, a few are of resinoid bond which may be affected adversely by strong alkaline coolants.

5—Viscosity. Coolants should be viscous enough to wet-out quickly, and so penetrate to the point of contact of wheel and work.

6—Rust prevention. Coolants should not cause rust on machine or work, they should prevent it by leaving an oily coating on the work.

7—Prevention of wheel loading. The majority of materials, but especially the softer metals and many non-metallic ones, load the wheel unless the coolant contains enough oil to lubricate the

wheel face, thus preventing the ground-off material from sticking in the pores.

8—Promoting good finish. Some coolants have a definite effect on the cutting action of a wheel and so influence the surface finish directly. An important factor is the ability of the coolant to wash away chips and dirt which, if caught between wheel and work, would mar the surface.

9—Must not separate or gum. Some coolants break down and deposit gums and sludge on the work blade or regulating wheel. That may prevent smooth and rapid movement of the work between the wheels. Such foreign material on the regulating wheel is likely to cause dimensional variations of the finished work and may even prevent the work from passing through the machine. Instability of some coolants causes this trouble.

10—Coolants should remain uniform in characteristics, so that they can be used in the same manner each time a new batch is received.

11—Coolants should not foam.

12—There should be no inflammable fluids in coolants.

13—Soluble oils and pastes should mix easily with water.

14—Coolants should not break down, become rancid, or rot. A disagreeable odor might result also because such conditions are conducive to the breeding of bacteria resulting in possible infection of the operators. Shop-wide epidemics have been traced to that cause. All coolants should contain an antiseptic prescribed by a doctor or other health authority.

Coolants used for centerless grinding are usually an emulsion of water and soluble oil or a mixture of water and paste grinding compound. Oil is usually preferred because it mixes much easier with water.

For steel use a mixture of from 20 to 40 times as much water as soluble oil. For cast iron use the above, as for steel, with the addition of one part of 25% concentration soda solution.

For aluminum, use the coolant as for steel with addition of two parts kerosene, to keep the soft aluminum chips out of the pores of the wheel, and to help prevent wheel glazing.

For grinding fibre, use paraffin oil alone as coolant.

For grinding rubber, carbon, celluloid, casein and most other non-metallic materials, use plain water as coolant. Since there is usually high stock removal the ordinary coolant tank has insufficient capacity, so use a large external settling tank, or let the used coolant run into a sewer.

It pays to keep a record of the exact coolant mixture used for each job. Some shops insist that it is necessary, or at least desirable, to change the type of

"TWENTY QUESTIONS" ON CENTERLESS GRINDING TROUBLES

Give yourself 5 points for each correct answer. If you score 80, you're good. If you score 90 or above, you're terrific.

Answers at end of article.

1. You are getting irregular light and dark spiral marks on some 24" bars ½" O.D. The grinder operater blames the material. What do you do?
2. You have a newly installed machine in perfect condition. You get spiral marks on some small pins, approximately ¼" O.D. and 8 inches long. You check the material and find it enters the machine in perfect condition. You decide regulating wheel dressing is at fault. What do you do?
3. You are using equipment in good condition, wheels trued, etc. Job is hard steel alloy armature shaft ground to high finish with fine wheel. You get scratches on the work. What do you check first?
4. You are grinding a soft steel piece, a simple conventional set-up. An infeed job grinding 3 diameters with a crush-formed wheel. You get scratches. What do you check first?
5. You have a thrufeed set-up grinding some 2" O.D. steel tubing, pieces about 4" long. This is a high production long run with the job set for maximum production rate. You are getting spiral scratches or feed lines on the pieces. What do you do?
6. You notice scoring of a few pieces just after a run has been set up and gotten well under way. A check reveals burrs and bits of abrasive imbedded in or fused into the work support blade. Remedy?
7. You have a short piece (3") of heavy gauge steel tubing approximately 4" O.D. The work doesn't seem to ride evenly during grinding, occasionally seems to ride up and then settle down again. What do you do?
8. Same job as (2) above, but instead of the trouble being in the regulating wheel, you decide the grinding wheel is cutting too heavily on one side. What to do?
9. You have a thrufeed job on some medium-sized steel rods. They gauge as barrel-shaped—tapering on both ends with a greater diameter in the center of the finished piece than at the ends. Cause and cure?
10. The reverse situation. You get hollow-shaped pieces with a greater diameter at both ends than at the middle of the rod. Cause and cure?
11. Same situation as in either (9) or (10) above: guides are set correctly and you still have trouble. What next?
12. The work is out of round. You can roll the piece in your fingers and feel it. Yet the micrometer shows uniform diameters all along. What do you check first? Cure?
13. You have a fairly large, heavy piece to be run in a large quantity. A check of three or four pieces shows that you are getting the desired high finish, but you can feel an occasional flat spot. What do you do?
14. You have an infeed job rough grinding two diameters of a short, heavy piece in one stage of an automated process which will finish grind the same diameters on the next machine. The work is out of round on the rough-grind. What do you check first? Cure?
15. You are working to very close tolerances on a small very hard steel alloy spindle—allowances of plus or minus .000005 inches. You just can't seem to hit the specs on the work, even after checking wheels, guides, vibration, balance, feeds, etc. What next?
16. You have an infeed job, grinding a straight shaft on a piece which has an irregular knob on the end of it. This is properly supported by a roller rest, wheels are properly trued, but you get a taper on the shaft instead of uniform diameter.
17. Same job as above, and you have corrected the trouble diagnosed. The job is set for automatic hydraulic feed and eject, but after running for 3 hours, a check shows you are not repeating dimensions accurately from one piece to the next. Where is the trouble?
18. You are getting chatter marks. A check of the wheel balance shows the wheel is not at fault. Spindles are OK. Apparently there is no cause for vibration in the machine itself. What next? What cure?
19. You are getting chatter marks. A check of the grinding wheel shows it to be out of balance. What do you do now?
20. You get chatter marks. There is no apparent source of vibration either within the machine or from external causes. Wheels are in balance. Guides, etc. are apparently adjusted properly. What do you check next?

Answers to "Twenty Questions"

1. Start by removing oil from the stock straightener. Next use a coolant with more detergent properties.
2. Dress the regulating wheel at the same angle as the wheel setting, otherwise small diameter work may be bent while traversing due to uneven pressure. If a clearance angle is desired, apply it to the grinding wheel.
3. Check the work support blade. It may be dirty, nicked, damaged. If in good condition, it may be the wrong material. For ultra finish grinding resinoid, brass, leather, or hard rubber work support blades are best.
4. Check the work support blade. It may be either defective as above or the wrong type. For soft steel use cast iron work support blades.
5. Feed lines are usually caused by the exit side of the grinding wheel in thru feed work. Check the machine set-up to be sure regulating wheel angle of inclination and the swivel angle are the same, and the regulating wheel automatic truing device set properly. Also try dressing the grinding wheel so there is a curve or taper on exit edge so it stops grinding about ½" from the exit side.
6. If the work blade is really damaged, get a fresh one. In any case, the first remedy is to increase the lubricating properties of the coolant.
7. Periodic deflections of the work are most commonly traced to the work support blade. Reduce the top angle. For large diameter work the blade angle should be less than when using the same length of blade for smaller diameters.
8. If the wheel is cutting too heavily on front or back or not cutting in the center of the wheel, dress the grinding wheel so that it cuts evenly from front to back to within ½" to 1" of back edge.
9. Barrel shaped work is caused by both the front and rear work guides being deflected toward the regulating wheel. Align properly.
10. Hollow-shaped work is caused when the work guides are deflected at one or both ends towards the grinding wheel. Align properly. Increase regulating wheel angle ¼ degree steps until condition is removed.
11. Check the contact of the work, blade, and regulating wheel with red lead. Take a straight piece of work, preferably a finish ground or test bar and coat lightly with red lead. Adjust front and rear guides on the regulating wheel side until the work can be slid along the top of the blade without striking the regulating wheel on the entrance side or the guide on the exit side. The full width of the face of the wheel, the blade, and the guides on the regulating wheel side should show contact with the work.
12. Micrometer fails to show out-of-roundness because the shape of the piece is essentially an equilateral arc triangle. This results from grinding with the center of the work in line with the centers of the wheels. Raise work blade and work while keeping it low enough to prevent chatter. If work must be raised to the chatter point, use a softer wheel. Work should be roughly half its diameter above centers of wheels.
13. The immediate cause of this condition is that the work stops rotating for a brief moment during grinding. The light cut for fine finish provides insufficient force by the grinding wheel to hold the work tightly enough against the regulating wheel which, as a result, permits the work to stop rotating. Equip work rest with pressure roller against the work.
14. Check if there is not perhaps too heavy stock removal on the roughing cuts. Try a lighter cut to round up the work and then heavier cuts. Or, the rough grind may get too few passes for the hardness of the work. About all you can do here is make more passes.
15. Check for adequate supply of clean coolant of proper lubricating properties and at the right temperature. On very fussy jobs, it is sometimes necessary to utilize temperature controls on the coolant which will maintain the work at a constant temperature during grinding. Inasmuch as the piece is gaged at room temperature, you will either have to allow for cooling and contraction after grinding or keep the work temperature down all the way.
16. One cause of unwanted tapers in infeed work which is perhaps not so easy to notice right off is a slightly tilted work support blade with one end a bit higher than the other. The high end of a piece against such a work blade will always have a greater diameter than the low end.
17. Check the infeed mechanism for wear. Occasionally play in the loading and unloading device will cause it to fail to set the work in exactly the same position every time. This can usually be corrected with minor adjustments.
18. Check for sources of vibration near the machine. Are there other large machines operating near by which could vibrate and cause the centerless to pick up vibrations through the floor? Check also for synchronous vibration where the centerless picks up vibration only when operated at the same time as a particular unit. Cure: vibration dampers or mount centerless on concrete pad which is independent of the rest of the flooring.
19. Temporary out-of-balance often occurs at the start of the run until it has absorbed coolant uniformly by running a while. Avoid this by running the wheel without coolant and without grinding at the end of the day until all coolant has been thrown off. For actual out-of-balance, test wheel on manufacturer's balancing device and adjust balance with rim weights on flange.
20. Chatter marks are always due to intermittent contact between grinding wheel and work. Check if wheel is too hard. Check angle of work blades; 30 degree angle is sufficient for most work.

coolant whenever grinding wheel is changed. This, however, seems not to be the rule.

Truing, Dressing & Balancing

Truing and dressing of wheels are operations whose aims, methods and effects often overlap. The main distinction is in their basic purposes.

Dressing a wheel is definitely a treatment of the wheel face to restore or change its cutting action. Truing, which may be done on the same wheel with the same tools, is done to restore concentricity, square up the wheel face, or restore it to a particular profile which the wheel is supposed to impress upon the work.

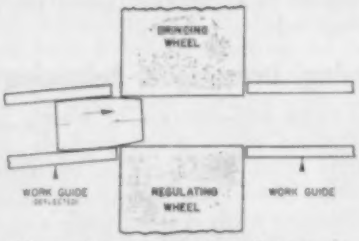
For ease of cutting and proper chip clearance, the abrasive grains in the wheel must be sharp and have adequate clearance. Normally, the grains do not enter the work to their full exposed length, and there is clearance between the bond and the work. This clearance diminishes as the points wear down without fracturing. There is also clearance between adjacent grains. Due to any of several causes, chief of which is perhaps the character, volume, and method of application of the coolant, this clearance may be lost through the loading of the wheel face with chips cut from the work, whereupon the wheel glazes, the work surface is impaired, temperature rises, and a dressing to clean the wheel is required.

In addition to truing which simply squares up the wheel face or rounds either its front or rear edges, there is also wheel truing either with a diamond truing tool or with a crush forming device which imparts a specific profile to the wheel.

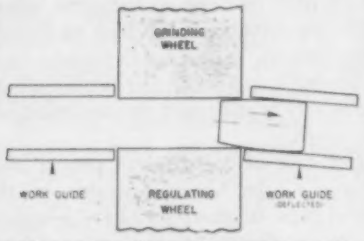
Modern centerless grinders have a variety of attachments, available either as extras or built-in on the machines which automatically and continuously dress and/or true the wheels.

In the Cincinnati centerless grinders, both the grinding and regulating wheels have individual built-on truing devices. Because in conventional grinding the grinding wheel may need truing or dressing for a number of reasons, the truing device is hydraulically operated. The regulating wheel, which only needs truing when setting up the machine or when its operating face has been marred or worn, has a hand operated truing mechanism.

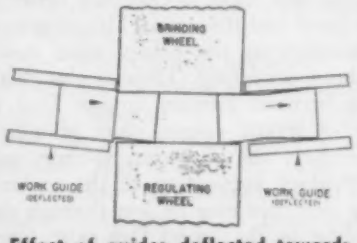
The Landis machines use a diamond regulating wheel truing device which is mounted rigid in the work rest. Since the work centerline is usually above and sometimes below the wheel centerline, provision is made for moving the diamond vertically. The diamond is then set to the same horizontal centerline as the work. The regulating wheel head is then traversed



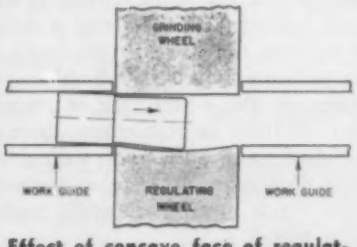
Effect of guides deflected towards regulating wheel, entrance side.



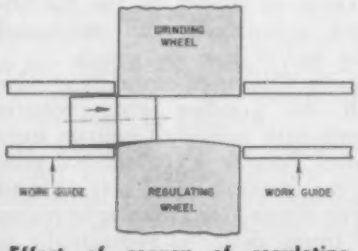
Effect of guides deflected towards regulating wheel, exit side.



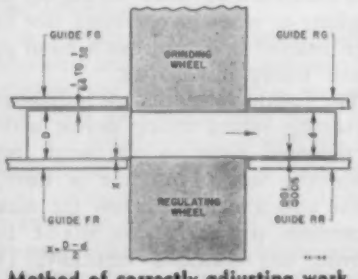
Effect of guides deflected towards grinding wheel.



Effect of concave face of regulating wheel at line of contact with work.



Effect of convex of regulating wheel at line of contact with work.



Method of correctly adjusting work guides.

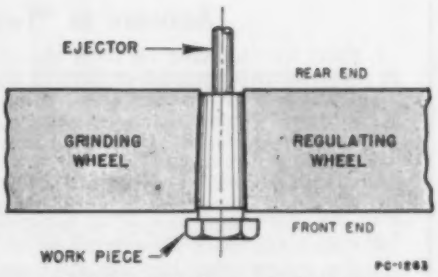
across the diamond. Regardless of the angle of tilt, the wheel is dressed properly. Other machines in this line use hydraulically operated profile dressers and hand operated devices.

In machines which provide automatic wheel balancing, the internal mechanism of the grinding wheel mount contains free floating steel balls in a raceway. These balls are free to take positions corresponding to the forces acting on them at operating speeds. Once they have settled into a relationship in which the wheel is in perfect static balance, the operator can lock them into position by pushing a lever. Rebalance with this system is so quick and easy that it is recommended that operators rebalance at reasonably frequent intervals, as through some small irregularity in bond or density a wheel which has been balanced can work itself out of balance during a run.

Faulty Grinding — Causes and Cures

Many of the faults of surface quality, shape, or dimension that may appear on a piece ground by the centerless method may be due to any one or more of several causes. The ability to quickly connect each symptom up with the "disease" will not only save spoiled work, but will save much time in searching out the trouble and trying wrong methods of cure.

For instance, one shop could not seem to get the required tolerance for straightness on a short cylindrical part which it was grinding by the thrufeed method for the first time. The first



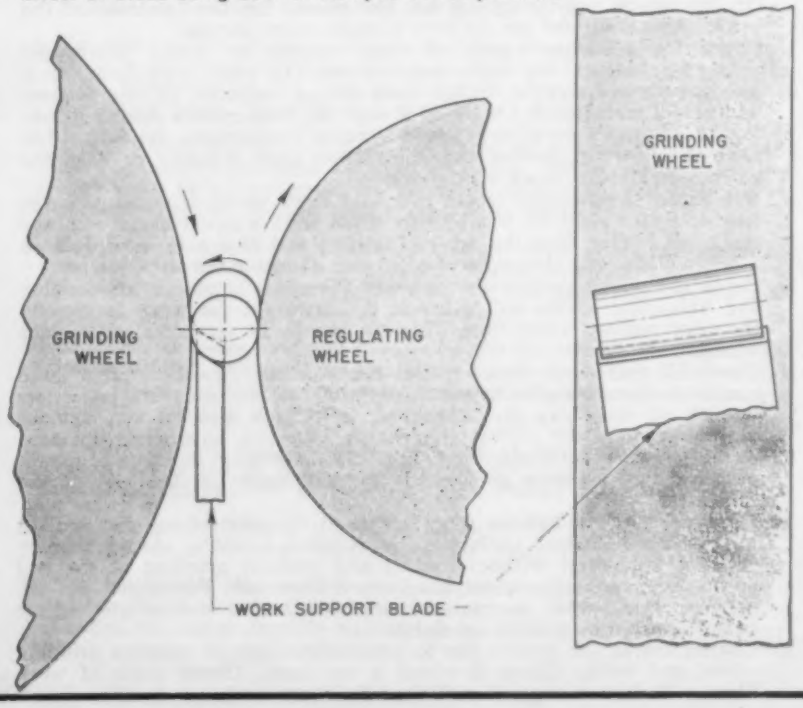
Straight infeed work becomes tapered when wheels are trued or out of parallel.

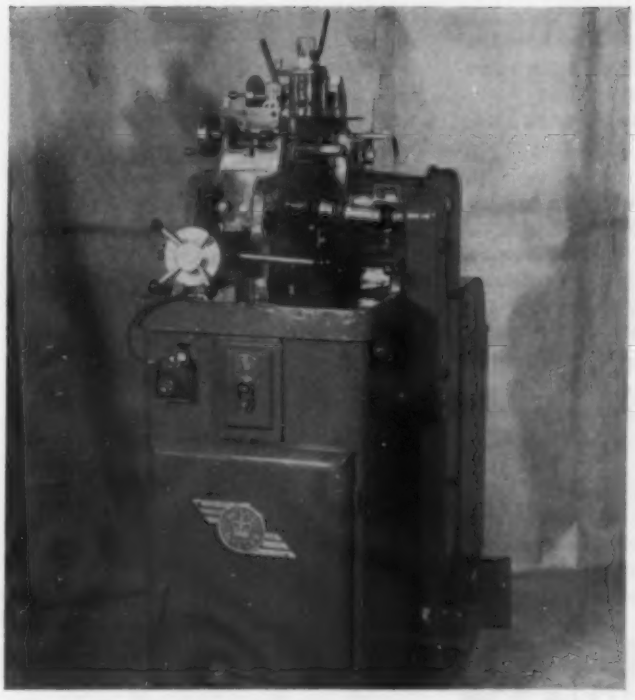
parts were all too large in diameter at the center of the piece. The well-meaning operator, who had an imperfect knowledge of what might cause this trouble, at once tried to correct the fault by re-truing the regulating wheel. That helped—but not enough. Further search showed that the cause was the most common of all—inaccurately aligned guides. A simple adjustment set the guides straight, and the trouble was over. Incidentally, care in setting up for the job would have made this trouble impossible at the start.

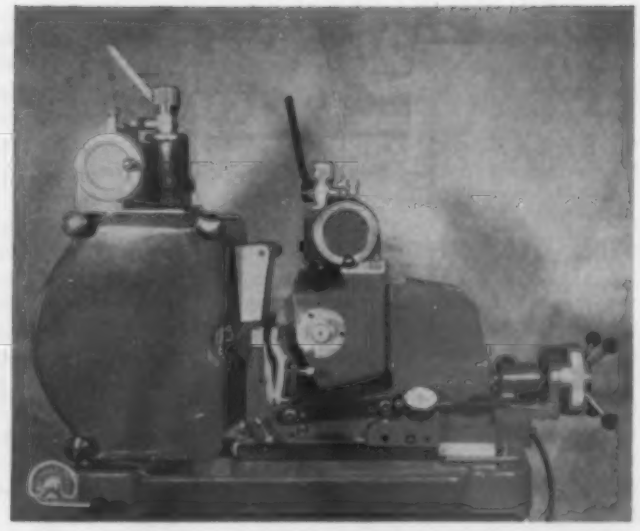
In this article we shall discuss the various faults of surface quality, shape and dimension that are likely to show up in centerless grinding by both the thrufeed and infeed methods. We will give the various causes that may be behind each fault as a guide to the shop in preventing them and in correcting them as quickly as possible if they appear.

Chatter marks on the surface of the work are probably the most common. They occur in both thrufeed and infeed grinding, and have the same causes in both types.

Effect of blade being bent or clamped out of parallel.







In this centerless grinder the regulating wheel spindle is mounted between the neoprene type ball bearings, which in turn are protected by a combination of nylon and neoprene shielding devices. This between-bearing mounting is said to prevent deflection of the regulating wheel spindle. The grinder is made by Royal Master, Inc., Riverdale, New Jersey.

Chatter marks are basically due to intermittent contact between the grinding wheel and the work, which may be caused by anyone of several conditions. The most prolific cause is machine vibration.

Vibrations may start within the machine itself due to such causes as an out-of-balance grinding wheel, changes in the speed of rotating parts, or too high speeds, variations in power input or torque, or uneven distribution of rotating weights. If vibration is evident it is usually a time-saver to start the search by checking the machine on these points.

Of them all, grinding wheel unbalance is probably the most common. When a new wheel is put on the machine it should first be given a rough dressing, then removed from the machine, tested on some type of balancing device and put in perfect balance by adjusting the weights which are spaced around the periphery of the flange. When in balance, replace the wheel on the machine and true the wheel accurately.

That does not end the wheel's possible guilt as a source of vibration, for as a wheel wears it is likely to become out of balance from time to time. Check its balance whenever chatter marks appear unless some other cause is obvious. Also, a temporary out-of-balance condition may arise from letting the wheel stand idle, as over night, which causes the coolant which the wheel has absorbed during the day to settle to the bottom. When the wheel is started again it will be badly out of balance until it has absorbed coolant uniformly throughout. This is a great waste of production time. Avoid it by running the wheel without coolant, and of course not grinding, at the end of the day, until all coolant has been thrown off. Many a mysterious and hard-to-find cause of chatter marks has ultimately been traced down to such a water-logged wheel.

If balancing the wheel does not correct the machine vibration, check the other points listed above to make certain that there are no loose parts and that all rotating parts are operating at the correct speed.

Never make the common mistake of trying to stop vibration by tightening the spindle bearings except after all else has failed. They are seldom the cause. To take them up may ruin the spindle assembly. The proper cure for vibration is to eliminate it—not damp it out at the bearings.

If a check of the machine shows no cause for vibration, it may come from causes outside of the machine. Such vibration is usually hard to find, and still harder to correct. It may be transmitted to the machine from other machines in the shop by way of the foundations. Still more difficult to detect is what is sometimes called "synchronous" or "sympathetic" vibration—when two machines, neither of which vibrate when operating alone, develop vibration when operating at the same time. Either type can sometimes be stopped in light grinding machines by tightening or loosening the anchor bolts, by using vibration dampers, or by moving the machine to a different location. If the grinder is a heavy machine it may be necessary to provide it with a separate foundation independent of the surrounding floor.

A blade angle which is too large or too small may be the cause of intermittent contact between wheel and work and consequent chatter. This is because the angle breaks down the grinding wheel pressure into two components — one acting vertically and tending to lift the work up from the blade and away from the wheel, and one acting horizontally.

How raising the work causes a break in contact is perfectly evident. This can be caused by a too-small blade angle, when for any reason less than the standard 30-degree angle is used. The small angle increases the vertical force component to a point where the normal balance of forces cannot hold the work against the wheel.

The vertical component also increases with the height of the work above the centerline of the wheels. This results in the work "bouncing" up and down. When up, the contact with the grinding wheel is broken, when down it is resumed, thus causing chatter marks.

The cure for this trouble is either to reduce the height of the work above centerline, or to use a softer wheel which will cut more freely and so give material removal with less total wheel pressure and consequently a smaller vertical component.

It is not immediately evident how a too great horizontal component of the grinding pressure can cause the wheel to lose contact with the work. There must be a balance between the blade angle, the grinding pressure and the length and thickness of the blade. If, because of a too-large blade angle, the horizontal component rises excessively a too-long or too-thin blade will give under the pressure and bend away from the grinding wheel, causing the

contact to break and make and resulting in chatter.

The blade must be as long as the grinding wheel is wide in order to support the work for the entire length of the grind. Since the total force, and hence the horizontal component, increases with the wheel width, it is often necessary to decrease the angle on wide wheel grinding to avoid chatter. Thus a 40-degree angle worked well with a wheel four inches wide, but caused chatter when tried with an eight inch wheel and blade. Since the eight inch wheel could not be avoided, the solution of the problem was found in substituting a 20 degree-blade angle. The smaller angle decreased the horizontal component enough to eliminate bending of the blade.

Since the area of contact between wheel and work increases with work diameter, a given unit wheel pressure will cause a greater total pressure and hence a greater horizontal component. If this causes chatter the solution again is to use a smaller blade angle.

Anything that permits the work blade to spring away from the grinding wheel will obviously cause chatter. This trouble may be due to using a work blade of a material so soft that it wears at mid-point from the rubbing contact with the work enough to permit the work piece to lose contact with the blade. There being no support there, the wheel pressure springs the work intermittently. Often a mysterious chatter can be traced to this cause, the cure being a substitution of a harder, longer wearing blade.

Even when all else is correct, chatter may be caused by any condition which leads to too-heavy grinding wheel pressure, such as too heavy a cut. If that is just due to "greediness"—taking too big a bite—the cure of course is to reduce the cut. Sometimes it is due to using a wheel that is too hard or fine, when the cut used might be satisfactory with a softer wheel. Reduce the cut or substitute a softer or coarser wheel.

A lot of the mystery of unaccountable chatter marks will disappear if it is kept strongly in mind that whether grinding is by thrufeed or infeed method, chatter is always due in the last analysis to intermittently broken contact, between work and grinding wheel.

Spiral marks, known also as "feedlines" are caused by the edge of the grinding wheel at the point where the work leaves grinding contact. The trouble will disappear if the wheel is trued either with a slight taper about ½" from the exit edge or a radius so that there will be no sharp corner on the wheel.

Scoring of the work is caused by bits of abrasive or work material becoming fused to the work blade. The cause is usually the use of coolant which has insufficient lubricating qualities or a too-hard blade.

When centerless ground pieces are out-of-round the trouble is annoying for it usually cannot be detected with a micrometer, the diameters all being equal. This is because the shape of the piece is that of an equilateral triangle whose sides instead of being straight are arcs. This results from grinding with the work at the height of the centerline of the wheels.

The remedy is to raise the work blade and work, while keeping it below the point where chatter will occur. Sometimes, however, the work must be raised to the chatter point in order to get the desired roundness, in which event, as we have seen, it will be necessary to use a softer wheel. The cause and cure of out-of-roundness is the same in both thrufeed and infeed grinding.

Flat spots on the work are often so minute that they cannot be detected by a micrometer or the unaided eye and yet are evident when the piece is rolled between the fingers. Strangely enough, these serious surface faults usually appear when a special effort is being made to give an extra fine finishing cut. They are most common on heavy work with light stock removal.

The immediate cause is that the work stops rotating momentarily. The light cut provides insufficient force by the grinding wheel to hold the work tightly enough against the regulating wheel which, as a result, permits the work to stop rotating before it has sparked out. It can be avoided by equipping the work rest with a pressure roller against the work.

Sometimes flat spots are due to load-

POPE PRECISION SPINDLES

Of Special Interest and Value To All TOOL ENGINEERS

See these Spindles at Federal Machinery Sales Co., Booth No. 392, ASTE Show

EXHIBIT A

POPE SUPER-PRECISION, HEAVY DUTY BORING SPINDLES for boring holes round within millionths of an inch. Available in both belt driven and motorized units to meet a wide range of speeds and horsepower. Send us your specifications for quotations.

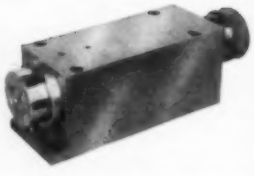


EXHIBIT B

POPE 1 HP, TOTALLY ENCLOSED 3600 RPM MOTORIZED, CARTRIDGE TYPE PRECISION SPINDLES with double row cylindrical roller bearings and separate thrust bearings for no endwise movement of the shaft

EXHIBIT D

POPE HEAVY DUTY, ¾ TO 100 HP DIRECT MOTORIZED SPINDLES for Horizontal or Vertical Skin Milling, Grinding, Milling, Boring and Other Operations

EXHIBIT F

POPE HEAVY DUTY VEE-BELT DRIVEN, PRECISION MILLING SPINDLES, and Wheel Heads, ½ to 50 HP

EXHIBIT G

POPE INTERNAL GRINDING SPINDLES for Bryant, Excello, Heald and Landis Grinders.

EXHIBIT C

NEW POPE QUICK, SELF-REMOVING WHEEL HOLDER for surface grinders and tool and cutter grinders — eliminates the necessity of a wheel puller. Write for quotations.

EXHIBIT E

POPE SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES with clearance Angle Swiveling Heads for Angular Adjustment In A Vertical Plane

EXHIBIT H

POPE SUPER-PRECISION HIGH FREQUENCY HEAVY DUTY GRINDING AND MILLING SPINDLES for speeds up to 100,000 RPM

No. 10P

WRITE FOR COMPLETE SPECIFICATIONS, PRICE AND DELIVERY

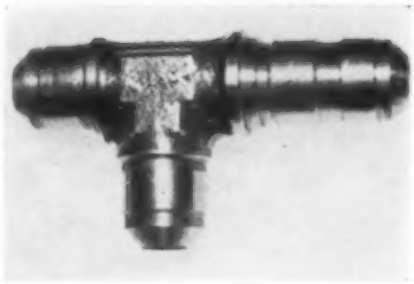
Specify POPE PRECISION SPINDLES

POPE MACHINERY CORPORATION

Established 1920

261 RIVER STREET · HAVERHILL, MASSACHUSETTS

Encircle No. 219 on postpaid card



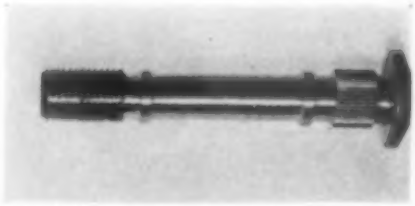
These two airplane hydraulic fittings took 20 seconds to grind per end from solid stock.

ing of the grinding wheel because the wheel is of too fine grain, too dense bond structure, or has been too finely dressed. Many operators make the mistake, when trying for a fine finish, of dressing the wheel with too slow a traverse of the dressing tool. In one case flats developed when the final dressing pass was slowest possible—three-quarters of an inch per minute—but disappeared when the speed was increased to four inches per minute. Until he was shown, the operator maintained that a satisfactory finish could not be secured with such an open dressing.

When pieces ground by the thrufeed method come through with unwanted tapers the cause is either careless set-up of the work support blade or work guides, or faulty dressing of the regulating or grinding wheel. These conditions are clearly shown by the accompanying sketches which are supplied by Cincinnati Grinders Incorporated. Sometimes it will be found that more than one of the conditions exist simultaneously. Which one, or ones, can only be determined by careful checking. That is a time-consuming activity which can be easily avoided by using reasonable care when setting up the machine at the start of a job.

A warped work support blade, or one whose top is not parallel to the centerline of the grinding wheel may cause non-straightness in several ways. It is easy to check and correct.

If the end of the piece that first contacts the wheels is tapered while the rest of the piece is straight, the trouble is doubtless that the work guides at the entering side are deflected toward the regulating wheel, which forces the front of the piece into the grinding wheel. Since the other end is straight it is evident that the guides on the leaving side are straight. If the front of the work is straight but the rear end tapered the reverse is true, that is, the entering guides are correctly set but those at the leaving side are deflected toward the regulating wheel, thus forcing the rear end of the work against the grinding wheel.



This bolt was ground in 20 seconds from solid stock, removing .070-.080-in. on dia. holding 26 dimensions.

From this it is plain that barrel shaped work, tapered at both ends, will result if both entering and leaving sets of guides are deflected toward the regulating wheel, while hollow ground work shows that both sets of guides are deflected toward the grinding wheel.

Barrel shaped pieces may also result if careless truing has given the regulating wheel a concave face, while hollow-grind work may be due to truing a concave face on the regulating wheel.

The causes of work not being straight in infeed grinding are entirely different from those that cause the trouble in thrufeed grinding.

If an unwanted taper appears on a piece that should be straight the obvious causes are either that the wheels are not the same distance apart for their whole width, or that a taper has been trued on one or both of the wheels, when none was desired. Both of these causes can be corrected by retruing the face of the offending wheel.

Another, not so evident, cause of unwanted taper in infeed grinding is a tilted work support blade, that is, one which is so carelessly set that one end is higher than the other. Since the distance between wheels increases with the distance above the centerlines of the wheels the high end of a cylindrical piece will be of greater diameter than the end that is nearer the wheel's centerlines.

Sometimes in infeed work difficulty is experienced in reproducing exact dimensions from piece to piece. This is due to play in the infeed mechanism due to wear. It can usually be corrected by making the appropriate adjustments. • •

This centerless grinder features self-contained, pre-lubricated, totally enclosed grinding wheel and regulating wheel spindles.

Crush dressing of the grinding wheel has proved to be very economical. It is quite common to grind ten times the number of parts with a crush dressed wheel over a diamond dressed wheel. When the crushing roll comes in contact with the surface of the wheel the pressure of the roll shatters the grain, similar to a gem stone which has been crushed beneath a hammer. This exposes sharp points rather than a dulled grain.

The editorial department of GRINDING and FINISHING wishes to thank the following companies, whose cooperation made this series possible: Cincinnati Grinders, Inc.; Landis Tool Co.; Simonds Abrasive Co.; Bay State Abrasive Products Co.; Norton Co.; Van Norman Co.; Royal Master, Inc.; Engelberg Huller Co.; Carborundum Co.; Heald Machine Co.

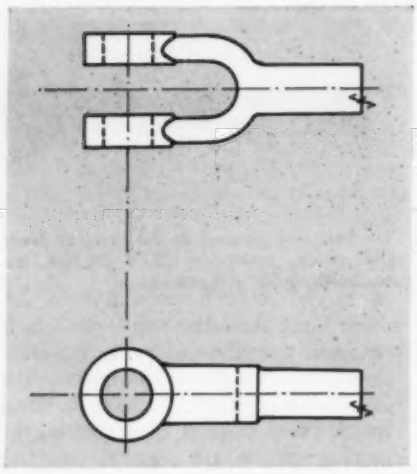


Figure 1. A simple and inexpensive fixture made for the yoke end.

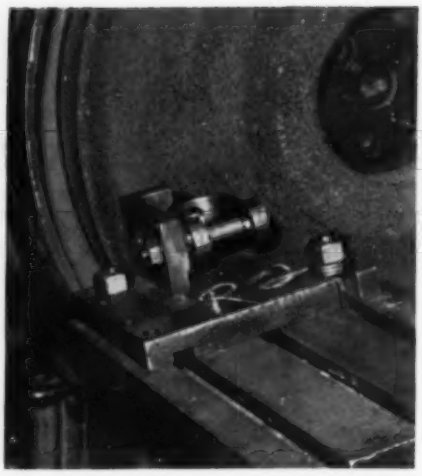


Figure 2. Yoke is being placed onto locating pin. Round end of yoke fits into horizontal vee which is cut into the back leg of the upright angle. Hole behind nut that holds pin is for pins of different size for other parts also used in this fixture. Note tapped holes in fixture base plate. They serve to hold different pins while fixture is in storage.

Figure 3. Operator is starting to pull table upward. Note counterweight below table to minimize operator fatigue. Same lever that moves table upward will also feed table if forced toward wheel.

Disk Grinder Speeds Finishing Operations

by **Hank Rohrer**

There are many milling operations that can be performed as good or better on a large disk grinder of the type shown here. There are several advantages to switch from milling to grinding:

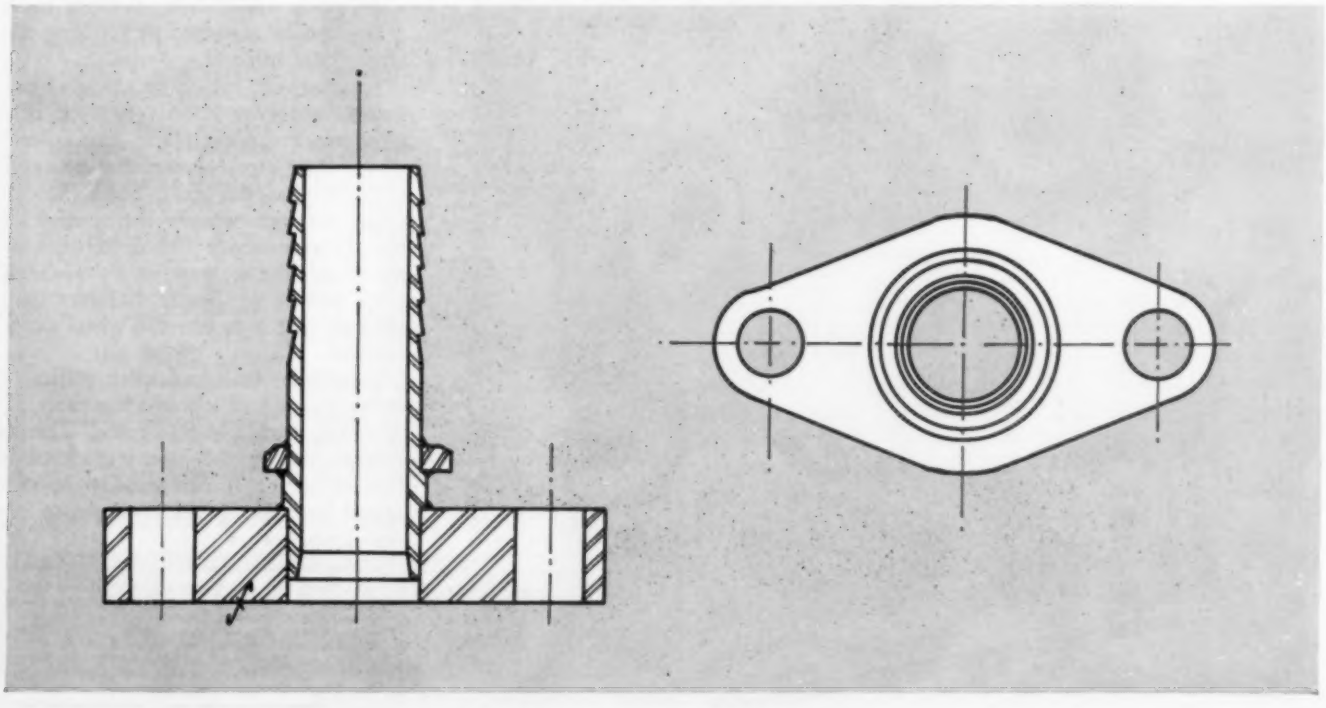
1. Less investment in the machine tool
2. Simpler, lighter and less costly tooling
3. Elimination of some clamping and unclamping operations
4. Lower set-up costs
5. In some cases, less finishing allowance on castings, therefore somewhat lower material costs
6. Less cutting time, therefore more production
7. Smoother finish without special efforts
8. Lower cost of perishable tools
9. No cutter sharpening required

The only requirement for a good disk grinder performance is the necessity for a well-dressed wheel.

Tooling for such a grinder is very simple and it can usually be produced for but a fraction of the cost of a milling fixture which must be designed strong to resist the thrust of the milling cutter and it must be provided with good clamps. Clamping can often be omitted in disk grinding fixtures as there is less thrust and the thrust can be resisted by proper design of the fixture.

A very simple and inexpensive fixture was made for the yoke end shown in Fig. 1. The yoke end, a forging,

Figure 4. A hose fitting with a heavy steel flange that required a fairly smooth and flat finish.



"American"
HIGH PRODUCTION
FOUNDRY WHEELS

METAL-EATERS TO
SNAG JOBS FASTER
AND MORE ECONOMICALLY!

Rough grinding at lower cost . . . fast stock removal . . . more output per man hour — you get 'em all when you use "American" high speed foundry wheels! Operators are enthusiastic about the ability of these wheels to hog-off surplus metal faster . . . and they like "American" cones for those hard-to-get-at places. "American" High Production Foundry Wheels, backed by long experience in this field, are available in a large variety of abrasives and structures assuring you a selection of ideal snagging wheels for economical operation. Write today for further information.

American Emery Wheel Works
Red Bridge, Providence, R. I.

Please send me information on "American" wheels for snagging operations.

Name .....
Title .....
Company .....
Address .....

Encircle No. 220 on postpaid card

Figure 5. Rear view of fixture. Flange of hose fitting is located on two pins and rested against two surfaces. Note fork end of clamp pulling against shoulder of hose fitting.

had to be milled flat on its round end for a subsequent buttwelding operation. The fixture consists of a plate onto which an upright angle has been welded. (Fig. 2).

A Vee-slot was milled into one leg of the angle to support the round end of the yoke. A hole was bored into the other leg for a threaded shoulder pin that is held tight by a hex nut. The work piece is slipped onto the pin until the eye touches the shoulder of the pin and the round end rests within the horizontal vee. The operator then holds the work piece by hand as shown in Fig. 3, while he moves the table upward and inward so that the yoke end describes an arc on the wheel surface. The long lever operated by the worker combines this arc movement with a predetermined amount of feed. It can readily be seen that the thrust of the wheel forces the work piece tighter into the vee and against the shoulder of the pin so that clamping is entirely unnecessary.

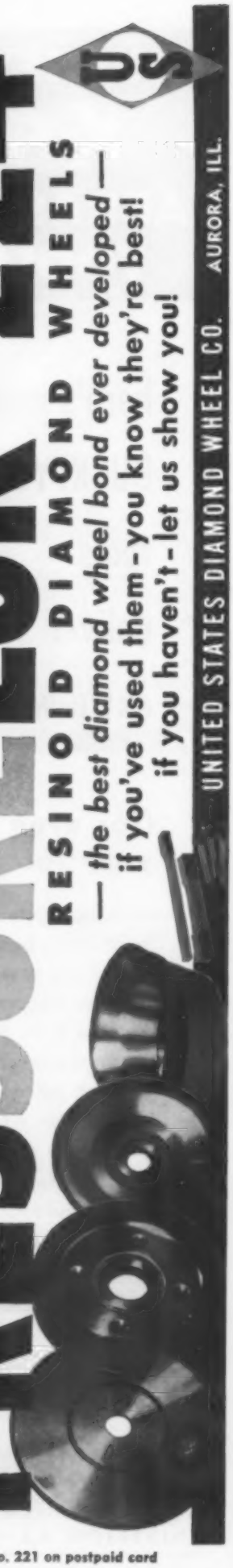
Figure 6. Flange of hose fitting in cutting position. (Guard is pushed aside for a better photograph.) Note spring beneath clamping stud. Spring aids in the unclamping operation.

PRESSURE LOK - 224

RESINOID DIAMOND WHEELS

— the best diamond wheel bond ever developed —
if you've used them - you know they're best!
if you haven't - let us show you!

UNITED STATES DIAMOND WHEEL CO. AURORA, ILL.

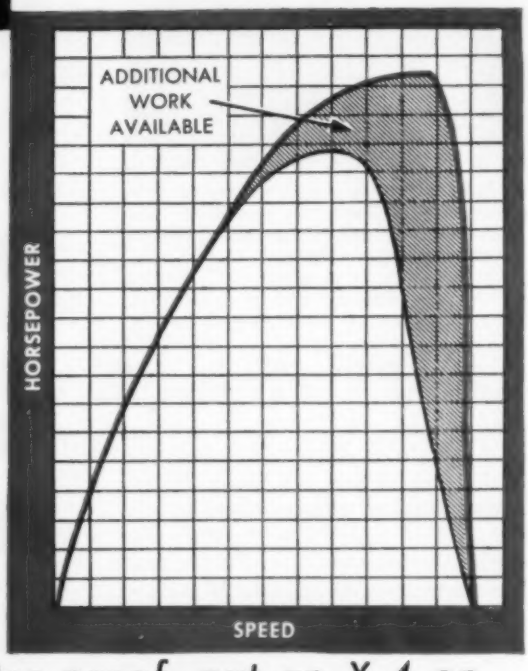


Encircle No. 221 on postpaid card

BUCKEYE X-4 ABRASIVE TOOLS

extra power...
same light weight...
greater efficiency...
MORE WORK PER TOOL!

here's proof BUCKEYE X-4 tools deliver extra work



(for even better proof, put an X-4 on your job and get that extra work!)

Look up the toughest metal removal job in your plant, maybe a job that's been fouling up your production schedule for some time. Put a new Buckeye X-4 tool on that job—and stand back!

What happened to the tough job? Why, it's all finished—just like that! And the tool operator's surprised grin lets you know he's never used a tool like this before . . . a tool that whips a tough job quick and easy. With Buckeye X-4 abrasive tools working for you, you'll grin, too—every time you look at that production schedule!

Complete information on these all-new, bright-red Buckeye X-4 abrasive tools will be found in our new Catalog A-10. We'll be glad to send you a copy . . . just tell us where and to whom.

You can get X-4 performance from your present Buckeye D, E and F Series grinders, buffers and sanders. Just tell us code names and serial numbers of tools you are now operating and we'll tell you how.

Buckeye Tools CORPORATION
DIVISION 45 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

Encircle No. 222 on postpaid card

Figure 7. Finished work piece shown next to disk grinding fixture. Disk grinder lends itself to many such finishing operations and gives greater production as well as better finish and lowered tooling and operating cost.

This fixture performed so well that several other holes were added and different size pilot pins were made to accommodate an entire series of different yokes. The shoulders of these additional pins were of different lengths so that the same vee could be used.

Figure 4 shows a hose fitting with a heavy steel flange that required a fairly smooth and flat finish. Although clamping would not be absolutely necessary, the fixture for this fitting was designed with a single, pivot type clamp for greater operator safety.

The brazed shoulder to the right of the heavy flange provided an ideal clamping surface. Figure 5 shows how the flange is located by two loosely fitting locating pins and how the recessed, fork-type clamp draws the work piece against the resting surface. Figure 6 shows the flange in grinding position, while Figure 7 illustrates the clamping arrangement and also shows the finished work piece.

The pivoted clamp consists of a flat bar to which a recessed, fork-type end is welded. This end reaches around the tubular section of the hose clamp between the flange and shoulder. A stud at the left side of the fixture fits thru a clearance hole of the clamp. The threaded end of this stud is engaged by a star knob. Note the spring between clamping bar and fixture plate which serves to loosen the clamp when the work piece is being removed. Figure 7 also shows the pivot point (at the right of the star knob).

All fixtures are provided with keys and slots to simplify the set-up. To load a fixture with a work piece, the table can be tilted out and away from the wheel. Proper counter balancing beneath the machine table holds operator fatigue to a minimum. • •

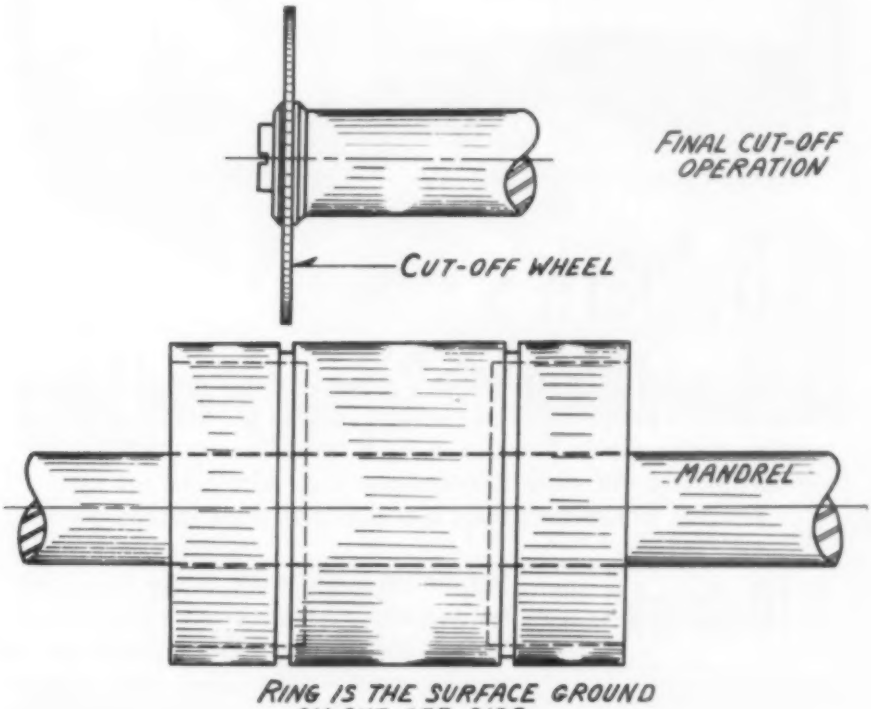
Shop Hints and Short Cuts

Method for Grinding A Small Lot of Hardened Steel Rings

By **H. J. Gerber**

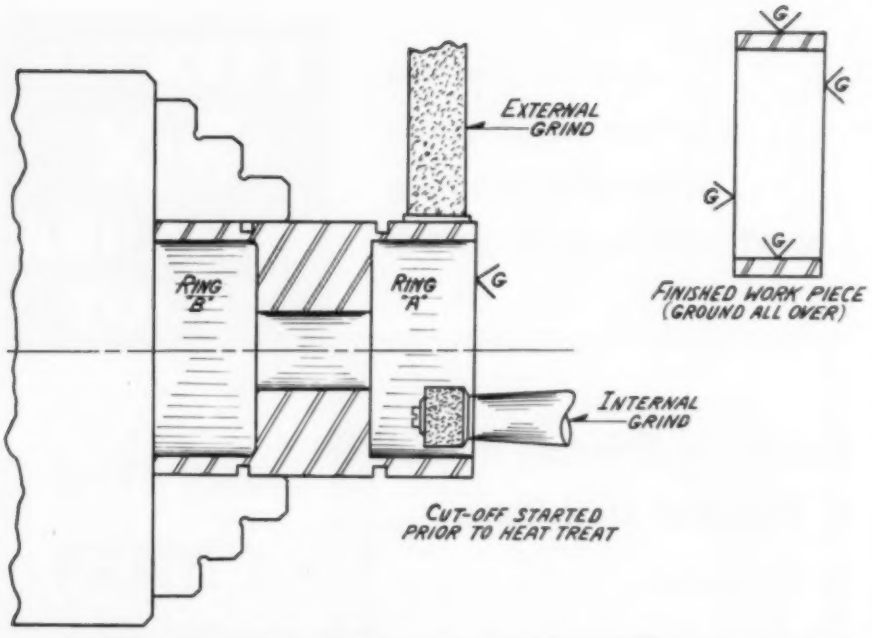
This job involved a small number of hardened steel rings made from 52100 steel. These rings were required to be precision ground to close limits of size, parallelism, and concentricity on all surfaces. On the first attempt to make these rings by conventional methods it was found that excessive distortion during heat treatment made them unusable. It was also decided that, without special tooling, it would be difficult to control alignment of I.D. and O.D. during grinding.

The successful method used for this job involved the making up of the rings in pairs (A and B) left attached to a small portion of the stock bar. These attached pairs were then run through heat treat and each ring was O.D., I.D., and face ground while chucked in one position in the universal grinder. After this operation they were mounted on a mandrel, placed in an axial hole through the



RING IS THE SURFACE GROUND ON CUT-OFF SIDE

Do you use short cuts in your work? Do you have any kinks which would be helpful to the next fellow? Send them to GRINDING and FINISHING for publication. All material is paid for! Material can be in your own words, drawings can be rough pencil sketches; our editorial and art departments will do the rest. Send your Hints and Kinks to: Editor, GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.



bar section, and each ring severed from the bar by a thin cut off wheel mounted in the tool and cutter grinder.

The cut-off surface on each ring was next ground parallel to the previously ground outer face surface, and to the proper width, by setting it up on the chuck of the surface grinder.

Leaving the rings attached to the bar section until final cut off has two advantages: The support of the central bar section assists in preventing excessive distortion during heat treatment and also acts as a mounting stub to grip in the chuck so that O.D., I.D., and face grind can be accomplished in one set up. This will assure absolute concentricity and parallelism without the use of any special tooilng.

Due to the small quantity involved the scrap loss of the unused bar section was negligible compared with the saving in time and special tooling. Actually these sections were annealed and returned to tool shop stock for eventual use. • •

Magnetic Chuck Set-Ups Made Easier

By **William Martin**

Magnetic chucks are widely used in all sorts of shops and have earned a solid position. Although they enjoy this widespread use, some of the principals of their operation are not so widely known. As a result, operators occasionally fail to make their set-ups in the easiest way.

For example, when the workpiece has a projection on it, many operators will use magnetic parallels to support the work. In some cases plain steel parallels could be used to advantage if the correct method of using them was known.

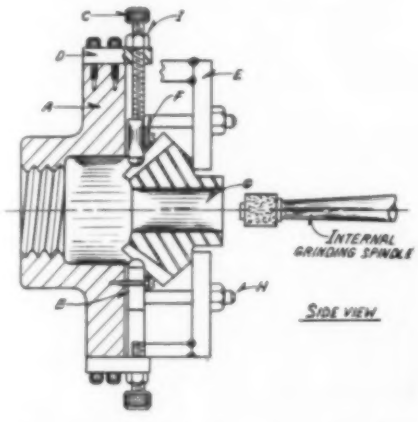
The drawing shows a flat plate with a projection on one end being ground. It is set up on plain steel bars. Many operators will claim that it cannot be done, but it can and works very well provided each parallel is entirely within or entirely outside the magnetic poles on the chuck. This will usually mean that the parallel cannot be over 5/8" wide. The second requirement is that some parallels be placed inside the poles and some outside the poles. This type of set-up can be very convenient and very useful in many cases. • •

Are You Looking For This?
• New method of gravity flow and magnetic attraction.
• Smaller filter . . . greater flow capacity.
• Greatly increased magnetic attraction.
• 25-50% less floor space required.
• More complete filtration.
• Greater swarf load capacity.
• Reduced operating costs.
• Out-performs all present units.
Announcing the NEWEST, MOST EFFICIENT, MOST POWERFUL MAGNETIC . . .
Delpark's
Patents Pending
Combined Magnetic Separator and Filter
CONTINUOUS, FULL FLOW, SELF-CLEANING, FULLY AUTOMATIC FOR THE REMOVAL OF FERROUS SLUDGE AND ABRASIVES FROM COOLANTS
Delpark
FIRST in Filtration Advancements
BACKED BY MORE THAN 40 YEARS EXPERIENCE IN INDUSTRIAL FILTRATION
UNEQUALLED IN EFFICIENCY . . . gives filtration performance never before possible on production work. The only separator using gravity flow of liquids on top of the greatest magnetic power giving benefit of both gravity and magnetic separation. Reduced filter size . . . 25 to 50% LESS FLOOR SPACE REQUIRED.
Write for more detailed information.
INDUSTRIAL FILTRATION COMPANY
Encircle No. 223 on postpaid card

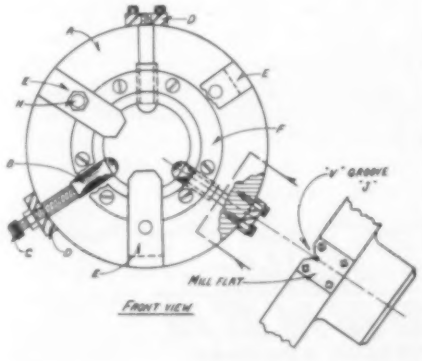
Precision Bevel Gear Grinding Chuck

By **H. J. Gerber**

This chuck was designed for the internal grinding of the bores in a small production run of hardened bevel gears. It was desired to accurately locate the gears from the previously cut teeth in order to insure a running accurately as nearly perfect as possible.



The chuck was built up on a threaded faceplate, "A", which screwed onto the headstock spindle of the internal grinding machine. Three accurately spaced "V" slots, "J", were milled and ground radially across the face of the backplate. Into these slots were located three spherical ended rolls, "B". These rolls were hardened and end ground with a spherical grinding attachment on the tool and cutter grinder. These spherical ends will contact the flanks of two adjacent gear teeth for accurate location. The rods, "B" are given an initial radial location through use of a master gear which was carefully dialed in to central position. Adjustment was made by knurled thumb screws, "C", and locked in place by nuts, "I". The rolls are held down tightly into the "V" slots, "J", by use of the hold down ring, "F", which is secured to the backplate by two screws straddling each roll, "B".



Three small flat plates, "D" are secured to flats on the periphery of backplate, "A", and are drilled and tapped to receive radial adjustment screws "C".

Gear "G" is held down tightly into the spherical rolls by three hold down clamps, "E", which are secured to the backplate by studs "H".

Great care must be taken to accurately index slots "J" and also to closely control the diameter and size of the radius on the rolls "B", when building this chuck.

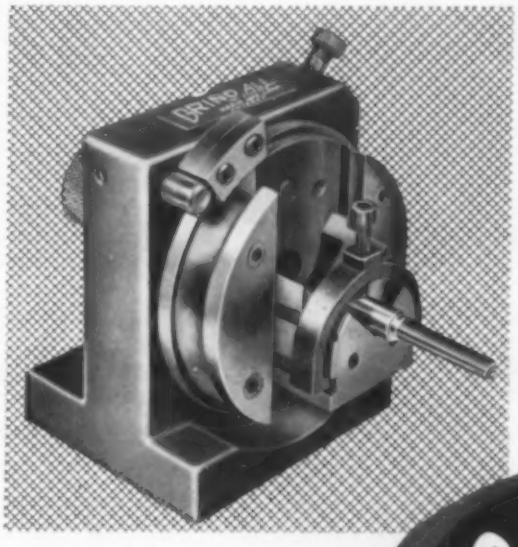
The chuck is not universal in use and was designed for one specific gear size only. For large production runs a more convenient clamping device could be arranged by using slotted clamp bars and hand nuts to lock them in place. • •

Prevent Damage to Centers

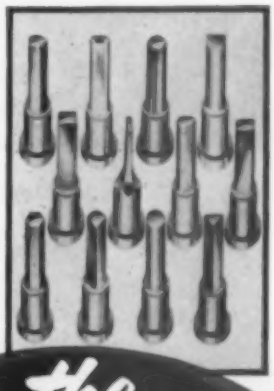
By **Clifford Molloy**

We have a number of cylindrical grinders in our shop. When we are performing an operation which does not require the use of the tail stock we usually remove the center as a safety measure. The sharp point can be a hazard when inserting or removing work from the chuck or when gaging the work.

Before the center can be replaced it is essential to clean the socket. This is not the easiest thing to do and most of the dirt gets pushed into the bottom of the socket. To prevent this we have taken some old centers and ground the points off. When the regular centers are removed these "safety" centers can be placed in the socket to prevent the entrance of dust and dirt. We have found them very handy. • •



Perforator Grinding
±.0002 with greatest speed accuracy and range



the Grind-All FIXTURE

made by the house that precision built

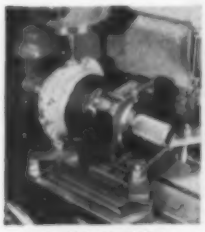
Headquarters for the Finest ... Precision Tools

Here is higher accuracy, greater range and maximum speed in grinding perforators. Meets the requirement for a more versatile perforator grinding attachment. Grinds many irregular shapes concentric with shank.

Also performs other functions such as light milling and boring fixture, inspection tool, etc.

Consult our engineering staff when you need precision tools or dies. Send for free catalog.

Harig Manufacturing Corp.



BORING FIXTURE

INSPECTION TOOL

Encircle No. 224 on postpaid card

STOCK REMOVAL

GEOMETRIC ACCURACY

PRECISION SIZING

SURFACE FINISH

sunnen honing

guarantees you straight, round holes—accurate to .0001" from end to end. Parts fit perfectly—last longer.

The self-sharpening stones shear off metal rapidly and produce any finish you desire—as fine as 2 micro-inches RMS in hardened steel.

SUNNEN HONING OFTEN ELIMINATES COSTLY DOUBLE-REAMING, BORE AND REAM OR INTERNAL GRINDING. ALSO ELIMINATES CHUCKING AND SET-UP TIME—CUTS COSTS! Dia. range **⅛" TO 2⅝"** in any shape or size part.

ROUGH BORE TO FINISHED HOLE IN ONE OPERATION

USE SUNNEN HONING FOR PRODUCTION
— MACHINE SHOP—PRODUCTION SALVAGE—MAINTENANCE

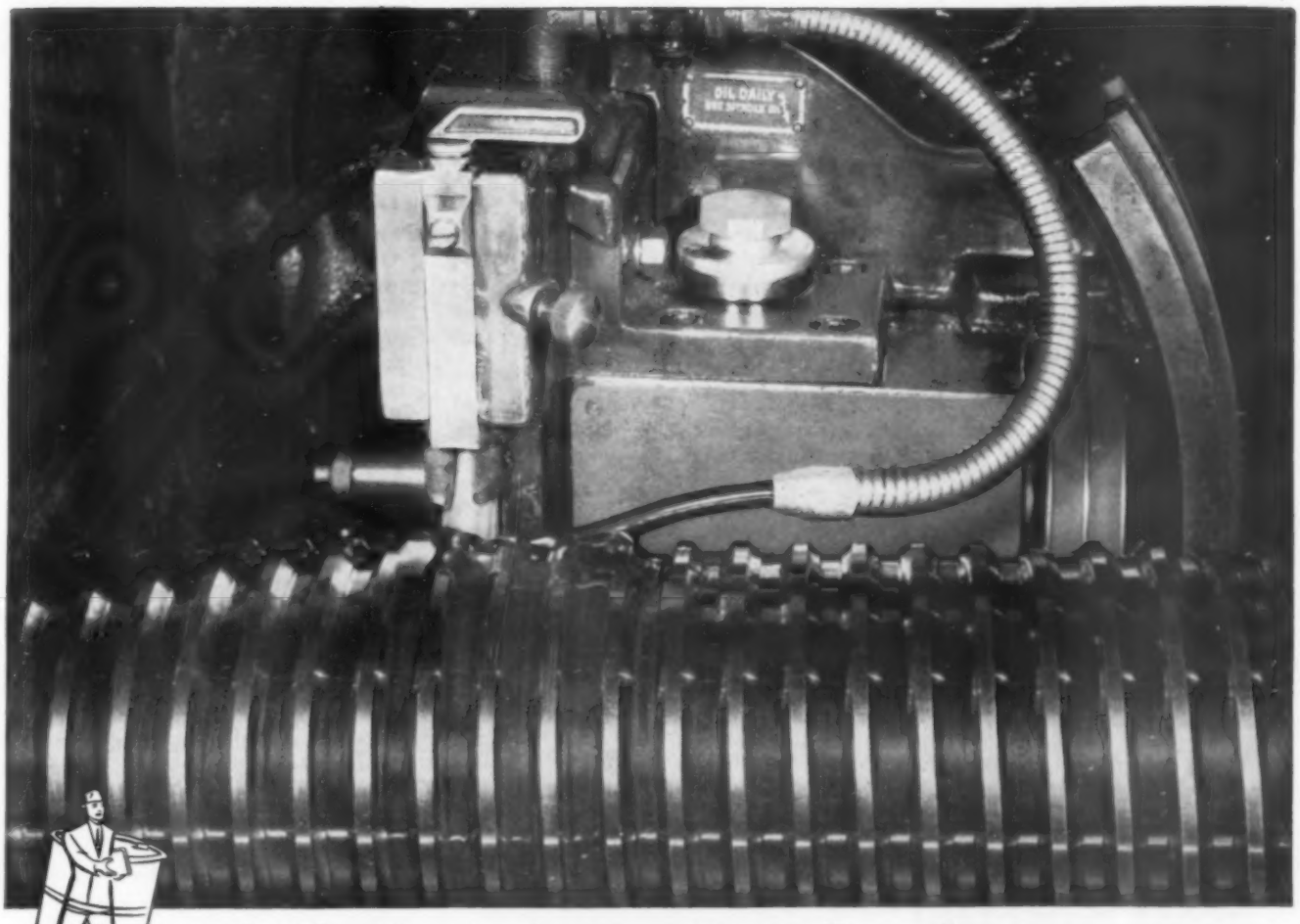
clip and mail coupon now

SEE SUNNEN HONING MACHINES IN OPERATION
BOOTH 474—MARCH 19-23
A. S. T. E. SHOW—CHICAGO

SUNNEN® 6783
PRODUCTS COMPANY
7929 MANCHESTER AVE. • ST. LOUIS 17, MO.
SEND FREE HONING PORTFOLIO
(CASE HISTORIES AND TECHNICAL INFORMATION)

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE____

Encircle No. 225 on postpaid card



Ask "the Man in the Barrel" to tell you how . . .

A Grinding Oil can *make* or *break* precision grinding jobs!

If you're using *just a coolant* or any oil that happens to be handy for those precision grinding jobs . . . it's costing you money!

A grinding oil can make or break a precision grinding job such as thread grinding, gear grinding and many types of form grinding. Grinding oils are usually classified as "hard-acting" or "soft-acting" depending on how they affect grinding wheel hardness. Grinding oil characteristics must be closely co-ordinated with wheel characteristics, speeds, feeds, and material machinability and hardness to obtain maximum performance.

When form grinding low hardness materials, where wheel form is important, a "hard-acting" oil helps to maintain proper wheel form by making the wheel act harder. As a result, greater wheel life is obtained and more accurate parts are produced.

When a high hardness material is being ground there is a tendency for the wheel to load-up and glaze. Such a condition is the cause of burnt work surfaces and heat checks, and is often encountered when grinding taps, gauges and other hardened parts. A "soft-acting" grinding oil will make the wheel act softer, opening up the wheel and exposing new abrasive grains to do the work.

Stuart's complete line of grinding oils have been chemically balanced and scientifically tested to meet the demands of various types of precision grinding operations. "The Man in the Barrel," your trained Stuart Representative, will be happy to assist you in selecting the proper grinding oil for your particular needs. Ask to have him call . . . and ask for a Stuart's Precision Grinding Oil Bulletin, too.

D. A. STUART OIL COMPANY, LTD.
2729-33 S. Troy St. Chicago 23, Ill.

More than a "Coolant" is Needed

Stuart Oils

Time Tested Cutting Fluids and Lubricants

Plants in: Chicago, Detroit, Cleveland, Hartford, Philadelphia and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

Encircle No. 226 on postpaid card

Department Expansion at Electro Refractories

A new product engineering department has been established for the grinding wheel division of Electro Refractories & Abrasives Corp.

The department will be headed by William Eames, in the newly created post of product engineer. His duties will include studying and collecting data on grinding wheel tests in various industrial plants throughout the country; introduction and evaluation of new products; trouble-shooting in the field; and working with salesmen, distributors and jobbers in grinding wheel education and customer contacts.

Eames has been with Electro ten years, including four years in the plant and six years in sales work in the Buffalo and Chicago areas.

G. Reagh Atkinson has been named to the newly created post of Manager of the Honing Stone Div. of the Mid-West Abrasive Co., according to an announcement today by A. C. Reppenhagen, President and General Manager.

Atkinson has been employed by Mid-West since early in 1946 and has been identified with the abrasive industry for nearly 20 years. He is one of the pioneers in both honing and superfinishing and has gained nationwide recognition for his work in the field.

J. William Wade, formerly sales and advertising executive of Spirella Company, Inc., has been appointed assistant to the manager of the Advertising Branch of The Carborundum Company, it was announced by Burchard M. Day, the company's advertising manager.

Brand New!

haskins

hask AIR Grinder...

most powerful air turbine grinder in its class!

75,000

R.P.M.

(1/5 H.P. prony brake test)

- **Permanently sealed bearings . . . never needs lubrication in air lines or grinder.**
- **Removable nose piece for deep grinding.**
- **Gyro action of turbine holds tool steady.**

Here's power—SUSTAINED POWER—like you've never experienced before in an air grinder . . . power unexceeded by any other air grinder in the same price range . . . maintains its high-speed efficiency under load! Built with a lightweight, contoured, hand-fitting aluminum housing, the Haskins hask AIR Grinder handles easily, balances perfectly . . . excellent for the most precise grinding job. Complete kit includes: carrying case, adapter hose, mounted points, dressing stone and wrenches.

for Complete details

WRITE

haskins

HASK-AIR HASK-FLEX

2649 W. Harrison St.
Chicago 12, Illinois

On Display at Booth No. 561

Encircle No. 227 on postpaid card

Finish Grinding With Abrasive Belts

Courtesy of Production Machine Co.
Greenfield, Mass.

A prospective customer recently sent samples of C.R.S. to us for grinding tests on our centerless machines. The requirements of stock removal, size tolerances, and surface finish were all very reasonable and well within the capabilities of our machines. Even the production rate may be considered as reasonable but this customer wanted all requirements met with a one pass operation. This of course is not possible with a single machine operation.

The coated abrasive belt is a wonderful cutting tool for stock removal and equally as good for smooth surface finishing, but the same belt cannot be used to obtain both heavy stock removal and smooth surface finish at the same time. As far as stock removal is concerned we all know that the coarser grit belts are more aggressive than the finer grit and that in most cases wet grinding is more efficient than the dry method. We also know that with the right combination of belt, belt speed, coolant, and contact wheel nearly any reasonable requirement of stock removal or surface finish can be met.

When we come to finishing operations, again we require the right combination of belt, belt speed, coolant, and contact wheel **plus** the correct sequence of belt grits. **There are no short cuts from a rough grind to a smooth finish** and as mentioned above, both cannot be obtained with a single operation.

To demonstrate, permit us to assume a grinding and finishing problem presented as follows:—To grind 1¾″ dia. C.R.S. stock reducing diameter .010″ with size tolerance of ±.001 and a surface finish of 30-32 microinches R.M.S. The first trial was with two passes 50 grit belt and one pass with 180 grit belt. The necessary stock was removed but surface finish was as rough as 50 R.M.S. Previous study and comparative tests indicate that the 180 grit belt should produce a surface of 30 to 50 R.M.S. We obviously then did not remove the 50 grit marks with the 180 grit belt. In the second trial we used a belt sequence of 50, 100, and 240 grit, one pass each. Again we found the stock removal satisfactory and this time a surface finish as rough as 40 R.M.S. In this case we believe the 100 grit belt cleaned out the 50 grit marks, but the 240 grit belt did not clean out the 100 grit marks. Note please the change of grit size on the first step is 50, whereas the second step jumps 140 in grit size. This would indicate an intermediate grit size of 150 or 180 to be advisable

which we believe will improve the finish obtained with the final 240 grit pass by perhaps 10 R.M.S. or a surface reading of about 30 to 32 R.M.S. The final trial using a 180 grit belt before the 240 grit belt proved this point as we were able to produce a surface finish of 25 to 35 microinches R.M.S.

An explanation of the reasons for the many passes required for this job may seem elementary to coated abrasive men or to our readers trained in grinding methods. There are, however, many who do not have this advantage and to whom we direct the following.

A 50 grit belt will cut into the surface of a work piece a certain depth leaving a rough scratch pattern. The reason for the rough cut in the first place is of course stock removal. When a fine finish is required after a rough cut the natural tendency seems to be to use a very fine grit belt. The result will be flattened peaks and the same deep valleys left by the 50 grit belt. We must therefore use a reasonable step-up of grit sizes working toward grinding down the peaks to the bottom of the valleys. Each belt in the finishing sequence must reduce the marks of the preceding belt until the desired surface finish is obtained.

We have proven to a certain degree that for belt economy and savings in production time this progressive method should be used. The number of passes required of course depends on the amount of stock to be removed and the final finish desired.

Abrasive Belt Speeds

It is very interesting to note how continued research can change and sometimes even reverse a trend in thinking on methods of solving various problems. This is particularly true on abrasive belt speed which is continuously under study in the laboratory.

It seems only a few years ago that we (and the coated abrasive industry) were recommending faster belt speeds on nearly every application, and rightly so as our tests indicated better belt efficiency at faster speeds. At that time our products were primarily for polishing and buffing operations and we standardized on a speed of about 8500 SFPM on our type 101 machines. All seemed well enough although occasionally we would hear of some customer's increasing or decreasing belt speed for his special needs.

The abrasive belt industry has continually improved their products, and because of the development of the waterproof belt, we have entered the grinding machine business. Since marketing the type 914 and 101-W machines we have been called upon to run tests on nearly every type of metal alloy. Some of the harder and tougher

W&B LUBRICANTS AND COOLANTS IMPROVE EVERY GRINDING JOB!

Sixty-seven solid years of *specialized experience* stand behind White & Bagley Grinding Lubricants and Coolants. Here are some of the W & B products that are *boosting production, reducing grinding costs,* and *producing better finishes* for more and more plants throughout the world:

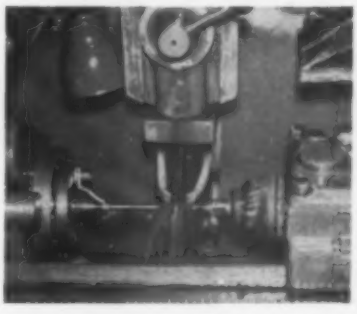
W & B Lubricant 1888 insures rapid and clean stock removal; keeps wheels open and free-cutting; permits the use of finer wheels to produce smooth finishes.

W & B Grinding Concentrate 1500 transparent and foamless; gives unusually keen grinding action and rapid chip settling; for grinding ferrous metals.

Courtesy, Norton Company

W & B Grinding Lubricant E-1 produces the highest reflective finish; permits rough grinding and finishing with the same wheel.

W & B Grinding Oil 1572 for close-tolerance, critical oil grinding; especially desirable on machines which perform a wide range of oil-grinding operations.



Courtesy, Jones & Lamson

W & B Base L adds potency (sulphur and fat) to petroleum or cutting oils to give improved results in grinding and machining.

Let us help you with *your* needs for grinding lubricants and coolants. We specialize in *your* requirements. For further information, mail the coupon today!

THE WHITE & BAGLEY CO.
Worcester, Mass. Detroit, Mich.
Originators of Grinding Lubricants

W+B INDUSTRIAL LUBRICANTS

The White & Bagley Company
Worcester, Mass.
Please send us more complete information on

☐ 1888 ☐ 1500 ☐ E-1 ☐ 1572 ☐ Base L

Name_____ Title_____

Company_____

Street_____

City_____ Zone____ State_____

Encircle No. 257 on postpaid card

A TRANSPARENT ALL-CHEMICAL SOLUTION FOR GRINDING

Lusol K-7 is a new all-chemical liquid concentrate designed for a wide variety of grinding operations. It is recommended for use on all steels and is particularly suited for cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. Instantaneously soluable in any water, hard or soft, it forms a clear, transparent, colorless solution that resists contamination, settles chips super-fast, and remains clear after repeated use. It is non-foaming and runs absolutely flat under all conditions. It provides maximum rust protection for all ferrous metals, including cast and malleable irons. It maintains clean wheels at all times. They just don't load up when you use Lusol K-7. For better grinding every time, use Lusol K-7. Write for complete information.

THE Lusol LINE

VISIT BOOTH 467—A.S.T.E. SHOW

. . . BETTER PRODUCTS FOR BETTER METAL WORKING

F. E. ANDERSON OIL CO., INC.

PORTLAND, CONNECTICUT

SAO55

Encircle No. 229 on postpaid card

stainless alloys did not respond to abrasive belt grinding as well as expected so additional research was requested. Needless to say many months of testing were involved with various types of belts, contact wheels, and coolants. A considerable amount of the data which we compiled has been reported for your information.

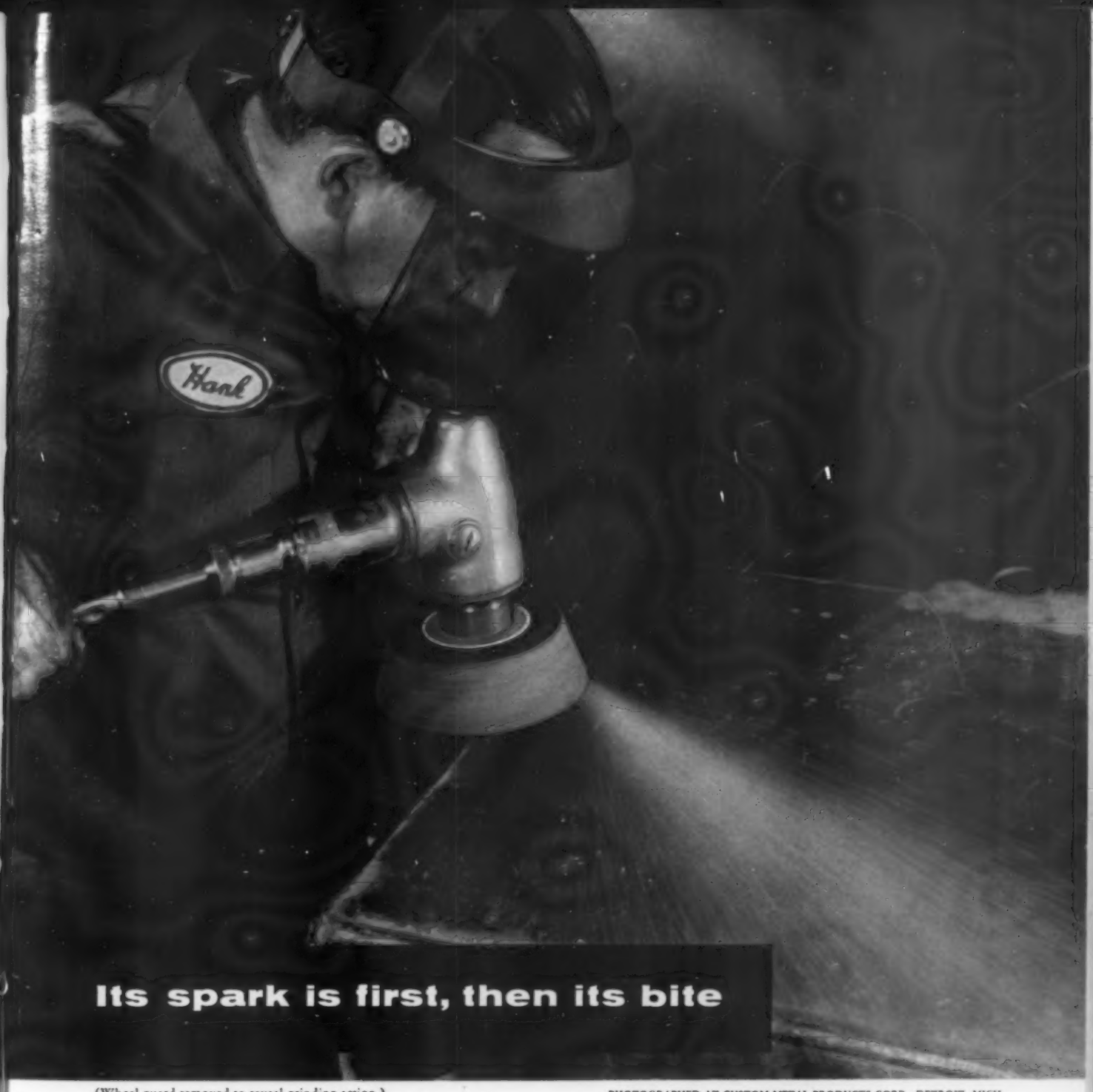
In reviewing these reports we note that we were very careful to outline various conditions such as type of material, surface condition, type and grit of belt used, coolant used and many other points, all of which are very important. We now realize that we omitted one very important bit of information which in many instances has meant the difference between success and failure on many of the more difficult grinding operations—BELT SPEED. The subject is of course far too extensive to attempt to cover here, but there are several facts which we outline and which we believe will be helpful to you.

We have learned from actual tests that on many materials heavier stock removal per pass is possible at reduced belt speeds. Grinding tests were made at speeds ranging from 2500 SFPM to 5000 SFPM and in nearly every instance better results were obtained in the lower ranges. The tests did not indicate the possibility of setting a fixed formula —or relationship between size of work and belt speed. They did however show that there is no advantage in using speeds above the 5000 SFPM range for grinding operations. Above this range of speed we enter into polishing and coolants do not add to the cutting efficiency of the abrasive belts.

Coolants and cutting oils lend an important part in the use of abrasive belts for grinding and here again the selection of the proper fluid can greatly add to cutting action. Again we cannot conclude that there is any fixed relationship between the type of coolant used and the belt speed. There are strong indications that the cutting oils available are preferred when grinding some of the stainless alloys. Tests have shown that this method has increased the stock removal rate and also the life of the abrasive belt.

New ideas and materials are coming to us about as fast as our research department can test them, but we want it that way as it means progress. •

Please Mention
GRINDING & FINISHING
When
Writing Advertisers



Its spark is first, then its bite

(Wheel guard removed to reveal grinding action.)

PHOTOGRAPHED AT CUSTOM METAL PRODUCTS CORP., DETROIT, MICH.

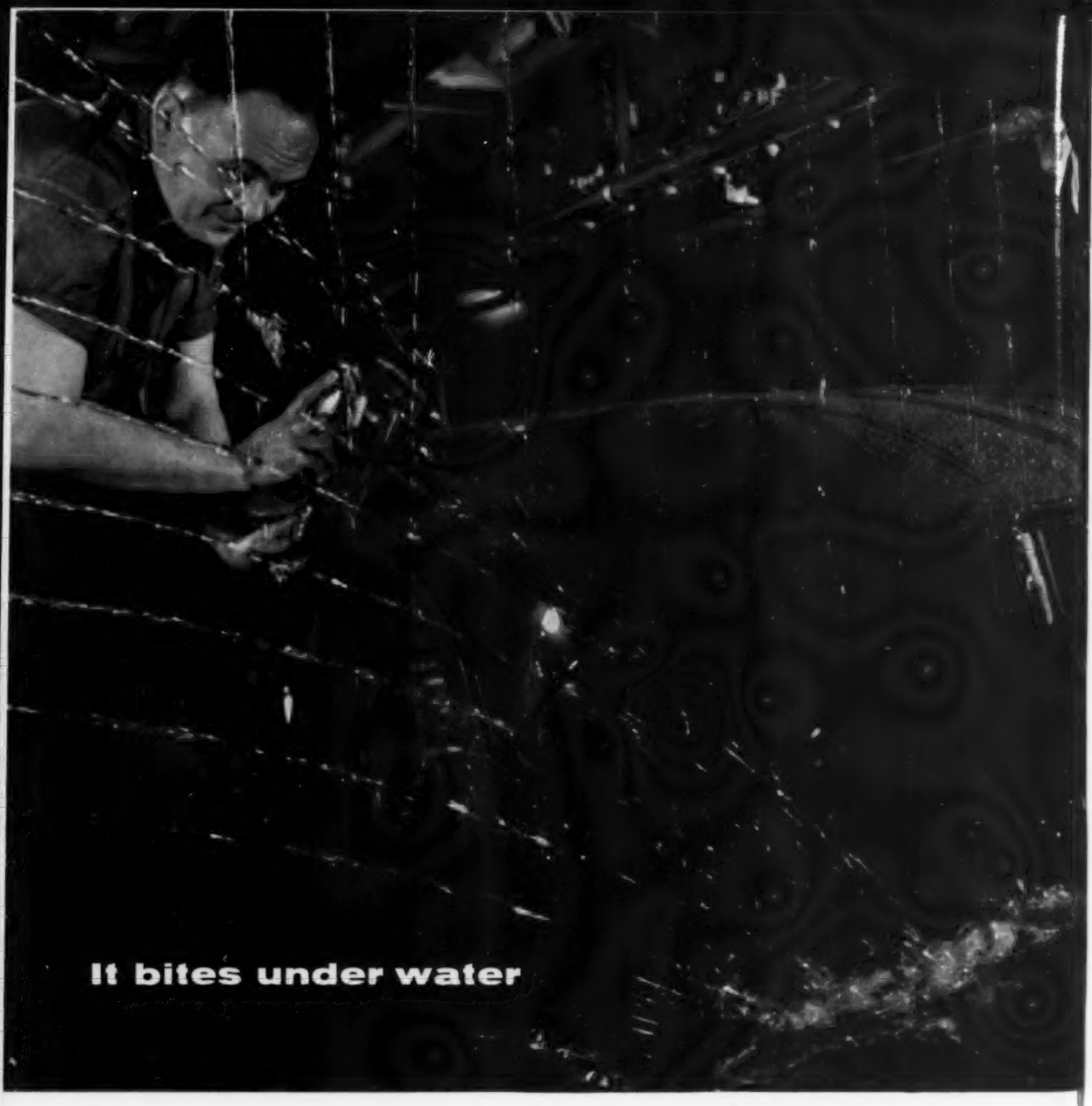
The portable grinding of weld beads demands a wheel that can take it. This B7 Bond Resinoid Cup Wheel, for instance, is built to chew through the heaviest welds you'll find. In fact, for all your rough grinding and snagging on castings and forgings, whether steel or non-ferrous, your best bet is a portable wheel by CARBORUNDUM. They're made in both aluminum oxide and silicon carbide, specially bonded to give maximum strength and safety even on severest applications. And they maintain their high initial rate of cut for the life of the wheel...give highest production at lowest abrasive cost. A good man to see is your CARBORUNDUM Distributor or salesman. He'll recommend the best wheel for every portable grinding job in your shop. Call him today, or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar



The wet sanding of undercoats on new automobile bodies is a rugged job CARBORUNDUM's Waterproof Papers are designed to do best. Their extremely high rate of cut, resistance to solvents, softness of back, and non-slip properties are features which help to meet the toughest production schedules.

CARBORUNDUM's complete family of Waterproof Papers includes types for every finishing and polishing operation, for surface preparation, and for sanding undercoats and lacquers. They are made in both aluminum oxide and silicon carbide grain, in 9 x 11" sheets, discs, and cut sheets to fit oscillating machines.

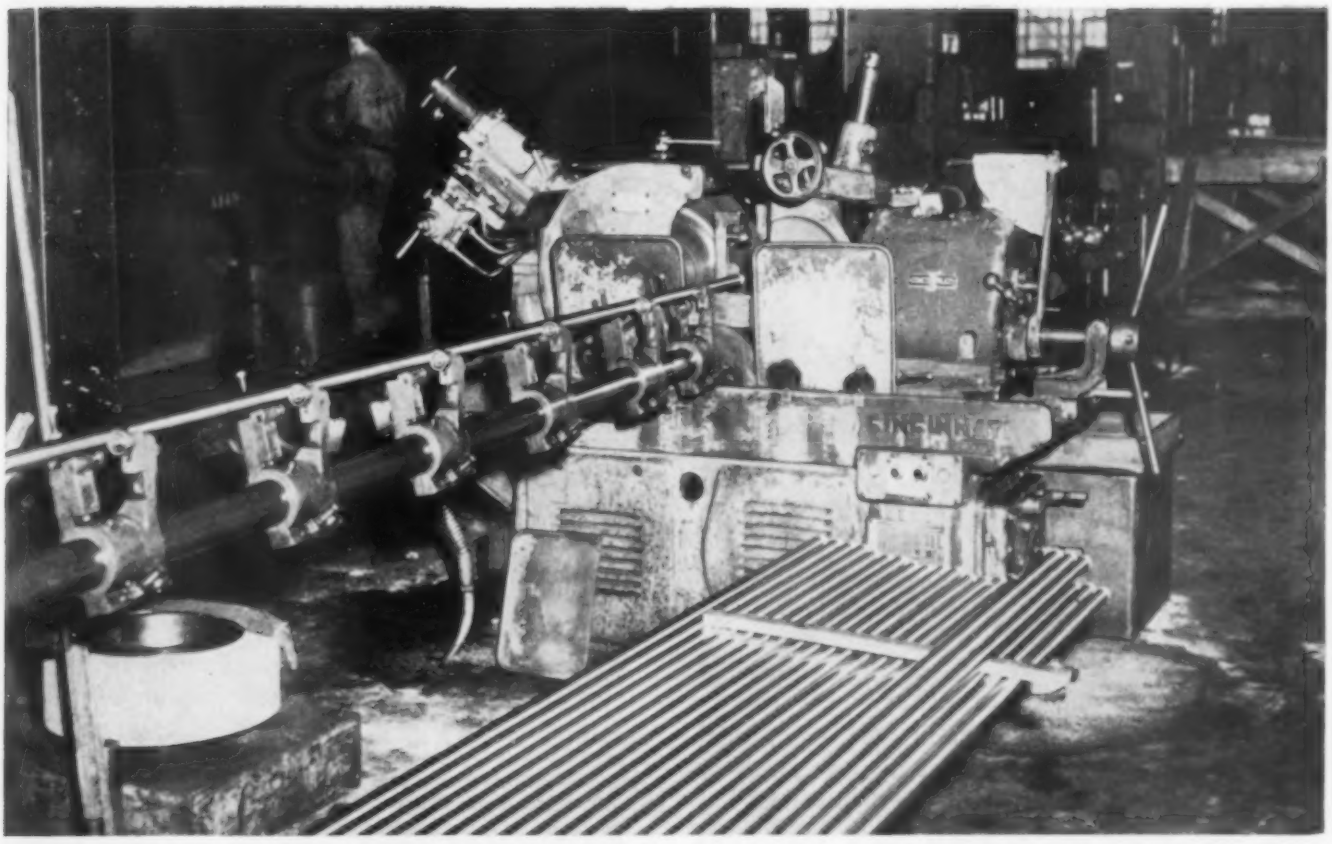
Your CARBORUNDUM Distributor or salesman is ready to demonstrate any of these superior waterproof papers in your finishing department. Call him today. Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar



Centerless brushing of nickelmoly steel pump rods is done on this set up. The rods vary in length from 6 feet to 36 feet. Centerless brushing gets the work into and out of the brushing area with minimum handling.

Brushing Set-ups Speed Production

by **Richard C. Bush,** Assistant Editor

One of the advantages of these brushing methods is that often one machine is capable of doing three jobs: rough and finish grinding, and final brushing. Frequently, the conversion from grinding to brushing takes only a few minutes.

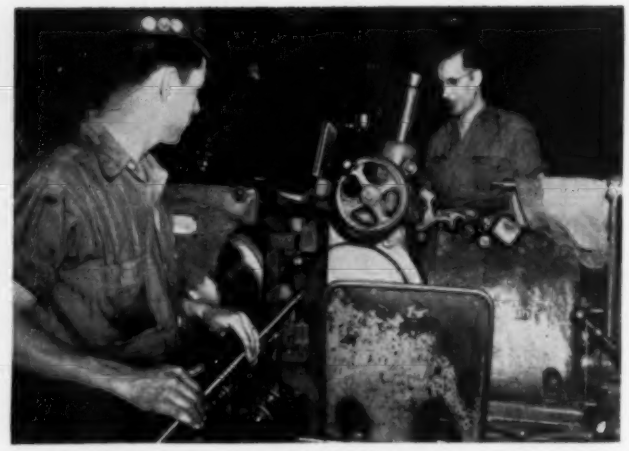
● Industrial brushing applications have become an integral part of almost every kind of manufacturing, process, handling and maintenance activity.

With demand for both increased quality and quantity production, many manufacturers found that parts finishing department would bottleneck other operations as production increased. For this reason, as well as to obtain necessary high quality production with minimum costs, the application of automatic brushing methods for removing burrs, sharp edges, toolmarks, and metallic detritus has increased many-fold.

One of the many problems confronting engineers planning the use of automatic or semi-automatic brushing machines at high production rates is that of getting the work pieces into and out of the machine in the shortest possible time.

This is one of the problems which has been overcome with the development of "centerless brushing" methods by the Osborn Mfg. Co., Cleveland, Ohio.

The principles of centerless grinding have been known and used for some time. In centerless brush-



Rough grinding removes .006-in. from the surface of the nickelmoly steel rods. A finish grinding takes off another .002-in. The machine is then converted to a centerless brusher which puts the final surface finish on the rod.

ing Osborn applies these same basic principles to brushing methods. The grinding wheel is replaced with a large diameter brush. Wire, tampico, or synthetic brush fill can be used, depending on the type of work, material and finish desired.

These new brushing methods were engineered primarily to satisfy the needs of manufacturers of precision parts. However, centerless brushing has since been employed for many other production operations.

One of the advantages of these brushing methods is that often one machine is capable of doing three jobs: rough and finish grinding, and final brushing. And frequently, the conversion from grinder to brusher takes only a few minutes.

In the operation shown in figure 1, a centerless grinder is used for rough grinding, taking off .006-in. from the surface of nickelmoly steel rods used in pumps. A finish grind takes off another .002-in., and the machine is then converted to a centerless brusher.

The action of the brushing is that of blending slight but important imperfections and surface irregularities rather than actual removal of metal. Brushes produce an effect on the surface that is not confined to the high spots but actually refines the entire surface. The result is that the edges of the slight pits and grooves in the metal surface are so blended as to change the focal stress pattern very favorably. Even the corrosive action on these rods is reduced.

Centerless brushing of these pump rods, varying from 1⅛-in. to 1½-in. in diameter, and from 6-ft. to 36-ft. in length are shown in figure 2. The operation of the machine is relatively easy. One man places the rod on the feed carriage. The regulating wheel, which runs at 52 revolutions per minute, is placed at a slight angle thus forcing the rod past the wheel surface. In a matter of minutes, the entire rod is brushed and is sent on to the next operation.

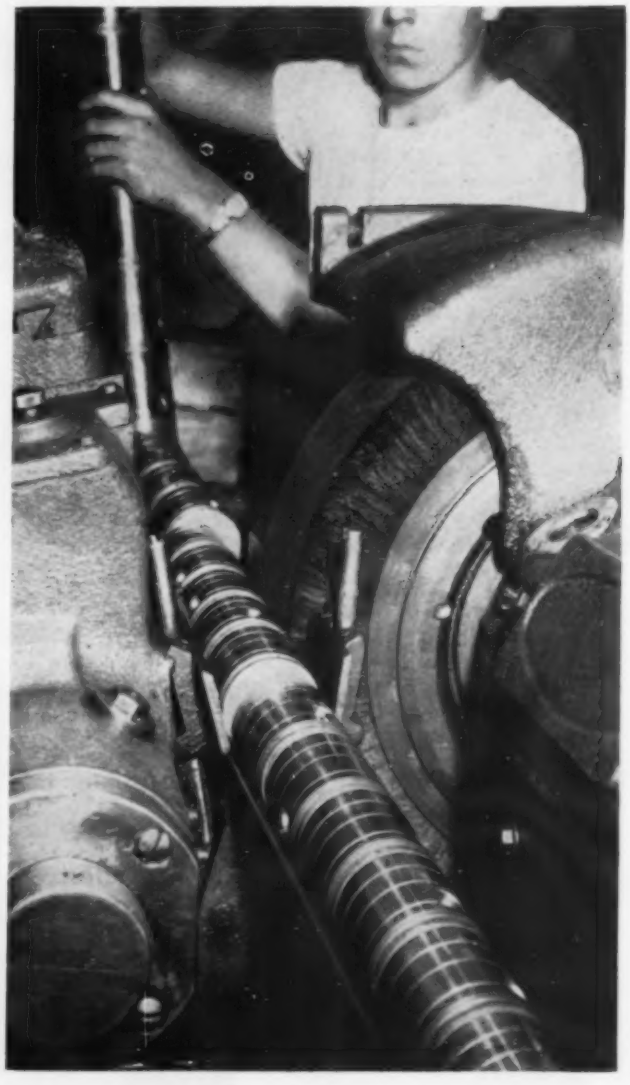
In addition to surface refinement to enhance resistance corrosion, a centerless brushing method is aiding a manufacturer of pistons by removing the residues and sharpness after grinding to make assembly easier in addition to prolonging the smooth working life of this part.

A 20-in. diameter wire brush is used on ordinary centerless grinders. The brush has a six inch face and is made with a suitable grade of tool steel wire. The pistons are machined, ground and then brushed. The work is gravity fed from a magazine type chute, figure 3. A small driving wheel, set at an angle, rotates the parts and drives them through the brush area. The brush rotates at 1200 rpm. Over 10,000 pistons are thus finished in an 8 hour shift.

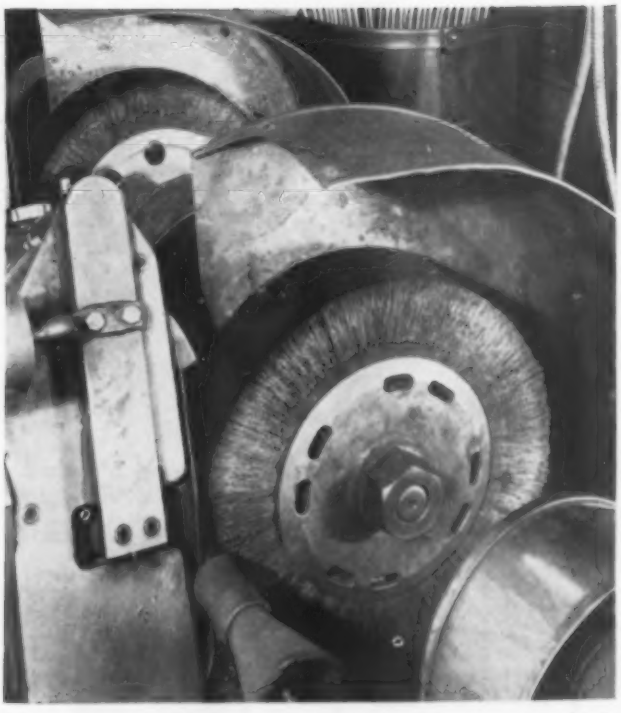
Another problem solved by a centerless brushing method was that of removing heat-treat discoloration and surface imperfections on tapered golf shafts. Due to the tapered "step-down" design of the cold-drawn heat-treated, alloy high carbon, seamless steel shaft, it was a problem to get into the "step-down" corners.

This installation was designed and engineered using the principles of centerless grinding, but not

Centerless brushing finishes pistons to micro-smoothness. By removing grit and surface irregularities, service life is increased of both piston and cylinder. Output of this machine is 10,000 pieces per 8 hours.



A 20 per cent production increase is being obtained with this five-station machine. Brushes remove heat-treat discoloration and surface imperfections from tapered "step-down" golf shafts.



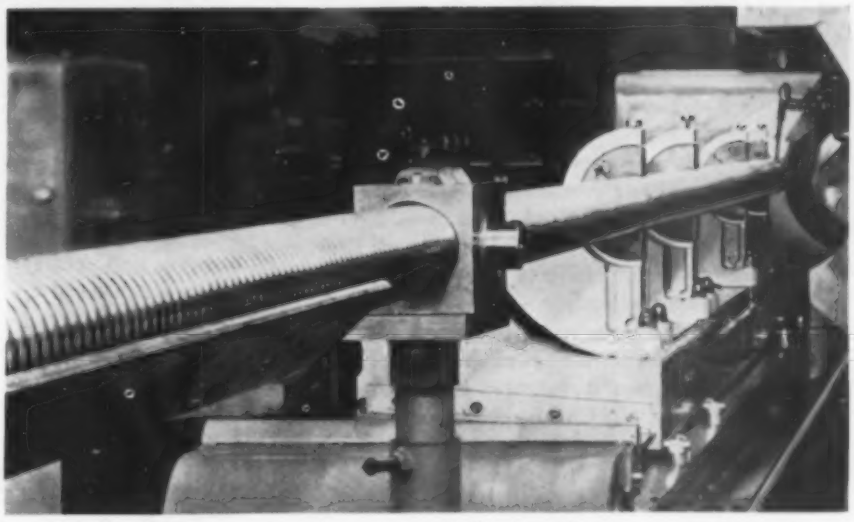
The problem of getting into the "step-down" corners is solved. With the old method, two or three passes were necessary to do the job. Now one pass provides a good surface for plating at the rate of 1500 shafts per 8 hour day, or 10 feet of shaft per minute.

using a centerless grinding machine, figure 4. A five-station machine is used. The shaft is hand fed into the first station. A power-in feed keeps it moving until it passes the last brush. The first station breaks the discoloration, the others remove it, and finally finish the surface. Because of the flexibility of the brush, there is no "bridging" the step-down corners, figure 5.

With this method only one pass is required to turn out over 1500 shafts per 8 hour shift, or 10 feet of shaft per minute. In addition to high production, a uniform surface finish prior to plating is obtained. Sharp edges and groove-like marks produced in manufacturing operations tend to build up relatively high current densities and as a result, the plating tends to emphasize the surface irregularities. Brushing eliminates this fault by removing the coarse, surface roughness. • •

Grinding a Forty-Foot Screw

Finish-grinding a screw thread forty feet long from solid steel stock is the unusual job recently accomplished by the owner of an Ex-Cell-O Style 120 Precision Thread Grinder. This "king-size" thread, 3½-in. in diameter with a .750-in. lead, is a gothic-type radius form designed for use with an antifriction circulating ball nut. Extra-long screws of this kind are widely used for actuator mechanisms in aircraft and in special machine tools.



While this 40-ft. screw length is exceptional, no unusual problems were encountered in the setup or in the actual grinding operation. The machine handles such long workpieces through a large hollow spindle. Four steady rests were used on the machine table, with independently mounted rests beyond the table ends. Thus spaced, these rests prevented the long workpiece from sagging and whipping as it rotated. To protect thread already ground, when the ground section extended beyond the machine, an antifriction ball nut support was used.

Three sections, each eight feet long, were first ground from rough to finish. Following this sequence the part was turned end-for-end and the two remaining thread sections were ground to complete the job. Normally, ten feet of thread can be ground in one setting. •

CHICAGO MOUNTED WHEELS

STILL FIRST AND FINEST

TO THE POINT, for 65 years Chicago Wheel has been first in mounted wheels, producing points that are engineered to do the job better, faster, at the lowest possible cost. Exacting production control methods provide you with a custom-built product covering every size, grain, and grade under positive density control.

Wheel guaranteed to never come loose from mandrel
CHICAGO
Positive density and grade control
When you think of mounted wheels, think of Chicago Wheel

Chicago Wheel pioneered the mounted wheel and is still the largest producer of these vital production tools. Isn't it logical that we can help you with your problem? There is a wheel to satisfy every application — in an infinite number of shapes and sizes, from the world's smallest to the world's largest. *Wheels when you want them* is but another reason why Chicago Wheel is still first.

CHICAGO WHEEL
& MFG. CO.
Dept. G • 1101 W. Monroe Street • Chicago 7

Encircle No. 230 on postpaid card

Common Errors And Corrections In Grinding Operations

Data through courtesy of The Grinding Wheel Institute

Cylindrical Grinding

Chatter Marks

Indication	*Cause*	*Correction*
Short, close, evenly spaced marks.	Loose wheel spindle bearings.	Reduce speed, tighten or readjust bearings, lap bearings to spindle, allow sufficient preliminary heating, take up thrust bearings.
Slightly longer and more widely spaced marks.	Wheel spindle sprung or out of round.	If warped replace, if out of round regrind and lap to new bearing.
Regularly spaced marks.	General vibration.	Check alignment and couplings, be sure motor and spindle are in balance.
Regularly but widely spaced marks.	Uneven flat belt.	Plane belt to uniform thickness and width; have all sections of uniform pliability.
	Idlers loose or out of balance.	Rebush and lap to shaft; balance carefully.
Long, regularly spaced chatter marks forming checkerboard pattern.	Wheel out of balance.	Rebalance carefully on own sleeve, repeat after truing. If trouble persists run wheel without coolant to throw off excess water, store on side to prevent water from settling at lower edge of wheel.
	Wheel out of round.	True before and after balancing, true sides to face.
Chatter marks long and widely spaced, regular in pattern but may vary around body of work.	Back-lash in drive gears.	Replace old gears or use V-belt drive; check lubricant.
Regular or irregular marks.	Faulty thrust bearings.	Replace thrust bearings.
Regular or irregularly spaced marks of any width but following one pattern.	Metal belt lacing on spindle drive.	Use endless belt.
Regularly spaced but occurring more frequently than above.	Loose pulley on spindle.	Tighten pulley.
Chatter marks synchronous with building vibration.	Building vibration.	If a heavy grinder provide a separate foundation independent of floor. If a light grinder tighten or loosen anchor bolts. Vibration dampers will often help. Moving the machine to a better location is sometimes the right solution.
Chatter marks fairly long, wide and evenly spaced at wide intervals and generally discolored; wheel glazed or loaded.	Wheel too hard.	Select softer grade or coarser grit. See "Wheel Glazing."
Irregular chatter marks.	Work centers or work rests not true or improperly lubricated.	Check fit of centers and rests; provide constant and even lubrication. On large jobs such as in roll grinding provide hold-down clamps on necks and arrange for adequate lubrication.
General.	Dressing.	Use sharp diamond rigidly held close to wheel.

Indication	*Cause*	*Correction*
Scratching of Work		
Narrow and deep regular marks.	Wheel too coarse.	Use finer grit.
Wide irregular marks of varying depth.	Wheel too soft.	Use harder grade. (See Grinding Grade of Wheel.)
Widely spaced spots on work.	Oil spots or glazed areas on wheel face.	Balance and true wheel. Avoid getting oil on wheel face.
Uneven marks on work.	Whipping belt.	Take up belt.
Fine spiral or thread on work.	Faulty wheel dresser.	Replace cracked or broken diamonds; use slower dressing traverse; set tools at angles of 5 degrees down and 30 degrees side; turn diamond every third dressing; tighten holder of diamond. Dress with less penetration; do not allow tool to dwell in contact with wheel; do not start dressing cuts on face—locate diamond on face but start cuts from edge. Make final pass in dressing in direction opposite to grinding traverse; traverse diamond evenly across face of wheel; round off wheel edges.
	Faulty operation.	Prevent penetration of advancing or following edge of wheel by being careful to dress wheel face parallel to work; reduce wheel pressure; replace worn parts which permit swiveling of wheel head. Provide additional steadyrests; reduce traverse in relation to work rotation; when making numerous passes make slight change in traverse rate at each pass to break up pattern.
Wavy traverse lines.	Ragged wheel edges.	Round off wheel edges.
Uneven traverse lines.	Worn traverse drive parts.	Eliminate play; replace worn parts.
Isolated deep marks.	Improper wheel dressing.	Use sharper dressing tools; flush wheel with coolant after dressing
	Chatter or hammering.	Remove cause. (See Chatter marks.)
	Coarse grits or foreign matter in wheel face.	Remove by dressing.
	Bond disintegrates, grit pulls out.	Coolant too alkaline for some organic bonds; decrease soda or change coolant.
Irregular marks.	Loose dirt settling on machine.	Keep air and shop clean; install dust collectors.
Irregular marks of various lengths and widths; scratches usually fishtail.	Dirty coolant.	Provide efficient filter; clean tank often, flush guards, etc., after dressing and when changing to finer wheels.
Deep irregular marks.	Loose wheel flanges.	Tighten flanges using blotters or lead washers.
Grit marks.	Wheel too coarse or too soft.	Select correct wheel.
	Too much difference in grit size between roughing and finishing wheels.	Use finer roughing wheel or finish out better with roughing wheel.
	Dressing too coarse.	Less dresser penetration and slower dresser traverse.
	Improper cut from finishing wheel.	Start with fairly high work and traverse speeds to remove previous wheel marks; finish out with high work and slow traverse speeds, allowing wheel to spark out.
Spirals on Work		
Spirals (traverse lines) same lead on work as rate of traverse.	Misalignment	Check alignment of head and tail stocks; also wheel head to work.

Cause	*Indication*	*Correction*
	Truing	Have truing tool set exactly on work-wheel contact line but pointed down 3 degrees. Round off edges of wheel face.
Grinding Grade of Wheels		
Lack of cut; glazing; some loading; burning of work; chatter.	Wheel acts too hard.	Increase work and traverse speeds; decrease spindle speed, wheel diameter and width of face; open up wheel by sharper dressing; increase wheel pressure (infeed); avoid dwell at end of traverse; avoid gummy coolants; use coarser grit or softer grade wheel.
Wheel marks on work; short wheel life; not holding cut; tapered work.	Wheel acts too soft.	Decrease work and traverse speeds and wheel pressure (infeed); increase spindle speed, wheel diameter and width of face; dress with slow traverse and slight penetration; filter coolant; do not pass off work at end of traverse.
Wheel Loading		
Metal lodged on abrasive grains or in wheel pores.	Incorrect wheel.	Use coarser grit or more open structure to provide chip clearance; use type of abrasive that fractures more easily; use more coolant.
	Faulty dressing.	Use sharper dresser; dress faster; clean wheel after dressing.
	Faulty coolant.	Use more, cleaner or thinner coolant.
	Faulty operation.	Manipulate to soften grinding grade of wheel. (See Grinding Grade of Wheel.) Use less infeed.
Wheel Glazing		
Shiny appearance; slick feel.	Improper wheel.	Use coarser grit, softer grade; manipulate wheel to get softer grinding effect. (See Grinding Grade of Wheel.)
	Improper Dressing.	Keep wheel sharp with sharp dresser, faster traverse, deeper penetration.
	Faulty coolant.	Use less oily coolant; use more coolant.
	Faulty operation.	Use greater infeed. (See Grinding Grade of Wheel.)
	Gummy coolant.	Increase soda content if water is hard; do not use soluble oils in hard water.
Inaccuracies in Work		
Work out of round.	Uneven pressure of driving dog.	Provide cushion between dog and work.
Work out of parallel or tapered.	Faulty grinding machine.	Correct worn ways and setting of tail- or headstock; tighten spindle bearings.
	Improper dressing.	Make sure machine conditions are same at point of dressing as at point of grinding.
	Improper operation.	Do not permit wheel to pass off work at end of traverse, which causes taper at work ends; reduce wheel feel; use harder wheel.
	Expansion of work.	Reduce temperature of work by using more coolant and lighter cuts.

Indication	*Cause*	*Correction*
Checking of Work		
Work shows check marks.	Improper wheel manipulation.	Prevent wheel from acting too hard. (See Grinding Grade of Wheel.) Do not force wheel into work; use larger and more even flow of coolant; prevent belt slippage.
Burning of Work		
Work shows discoloration.	Improper wheel.	Use softer wheel or manipulate to get softer effect. (See Grinding Grade of Wheel.) Prevent glazing and loading; use more coolant; prevent chatter.
	Faulty operation.	Bring wheel to work more gradually, use less infeed; eliminate belt or wheel slippage; prevent possible stoppage of work.
Centerless Grinding		
Irregular light and dark spirals.	Stock.	Remove all oil from stock straightener, use detergent coolant.
	Dressing.	Dress regulating wheel at same angle as wheel setting, otherwise small diameter work may be bent while traversing due to uneven pressure. If clearance angle is wanted apply to grinding wheel.
Scratching (Fine Wheels).	Work support blade.	For ultra finish grinding, resinoid, brass, leather or hard rubber work support blades are best.
Scratching (General).	Work support blade.	For soft steel use cast iron work support blades.
Periodic deflections of work.	Work support blade.	Reduce top angle. For large diameter work the blade angle should be less than when using the same length of blade for smaller diameters.
Chatter.	Wheel.	Too hard or too fine; loose on sleeve. Correct these conditions.
Chatter.	Work support blade.	Too sharp an angle or not properly clamped.
Scoring.	Coolant.	Requires more lubricating qualities.
Spirals on work.	Wheel cutting too heavily on front or back, or not cutting in center of wheel.	Dress grinding wheel so that it cuts from front to within ½″ to 1″ back of edge.
	Work support plates not parallel with work contact line on regulating wheel.	Line up guide plates with lining bar of approximately same diameter as work being ground. If guides are parallel and wheel dressed correctly increase regulating wheel housing angle ½ degree more than regulating wheel truing device angle.
High centers, low ends.	Improper alignment of guides or regulating wheel angles.	Align guides and if still at fault decrease regulating wheel angle by ¼ degree steps until corrected.
Low centers and high ends.	Improper alignment of guides or regulating wheel angles.	Align guides and if still at fault increase regulating wheel angle by ¼ degree steps until corrected.
Work out of round.	Too heavy stock removal on roughing cuts.	First cut light to round up work, then use heavier cuts.
	Too few passes on hardened work.	Increase number of passes if necessary.

Indication	*Cause*	*Correction*
	Too near center line of wheels.	Raise center height of work to one half diameter of work above center line of wheels.
	Not enough coolant.	See that copious supply of clean coolant is available at point of contact.
	Wheel grade too hard.	As last resort use softer wheel.
Chatter.	Loose spindle bearings or other loose drive parts.	Lap spindle bearings.
	Too high above center.	Decrease center height.
	Too great angle on work rest blade.	Use 30 degree blade angle which is sufficient in 90% of cases.
Unable to straighten kinks out of shaftings.	Shafting not straightened in punch press or other device.	Straighten as well as possible; a centerless grinder is not a straightening machine.
	Failure to allow enough stock on the work for grinding.	Allow grinding to equal from 2½ to 3 times the amount of run-out.
	Too great grinding pressure.	On first pass take light cut at low wheel speed and high traverse rates.

Internal Grinding

Source of fault	*Methods of Correction*
Spindles.	High speed internal grinder spindles of the ball bearing type are very sensitive to slight irregularities. Because of their special construction and special races and balls it is best that repairs be made only by the spindle manufacturer.
Machine play.	Since both wheel and workheads may be of the swivelling type they must be checked for play and anchorage.
Belts.	Internal grinder belts with their high speed, short centers and small diameter pulleys must be checked frequently for oiliness, wear and tightness; slippage is an especially serious fault.
Dressing.	Faulty dressing is one of the most frequent causes of faulty grinding, short wheel life and poor finish. Keep careful watch to prevent wear in the diamond holder bearings. Because of the small size of the wheels used in internal grinding it is essential that the diamond be of proper size and maintained with a sharp point.
Wheel characteristics.	Most internal wheels are less efficient than other wheels because of the extreme change in wheel diameter with no corresponding change in spindle speed. It is often possible to increase wheel life by using a wheel of greater width. Due to the limitations of chip clearance in internal grinding it is necessary to use coarse, open wheels.
Taper in straight hole.	Be sure wheelhead is parallel with table travel; use softer wheel or increase work speed for softer effect; correct work or wheelhead angling; prevent gumminess of coolant; use lighter infeed; be sure wheel is dressed parallel to table travel; use harder wheel.
Bell-mouth.	Reduce overtravel of wheel from hole.
Faulty taper	Be sure wheel is parallel to desired taper; eliminate backlash in headstock; harden or soften grinding grade of wheel as required. See Grinding Grade of Wheel.-

Wheel Breakage

Type of break	*Correction*
Radial break, three or more pieces.	Reduce wheel speed if excessive. Consult Safety Code for safe operating speed for the type of wheel in question. Correct improper mounting such as lack of blotters, tight arbor, uneven flange pressure, dirt between flanges and wheel. Prevent overheating due to lack of coolant or excessive wheel pressure on work. Sound wheel before mounting by tapping it to be sure it was not damaged in transit or handling.
Radial break, two pieces.	Avoid excessive side train.
General.	Do not use a wheel that is too tight on the arbor or sleeve, as it may break when started. See instruction booklet on "Mounting Technique for Wheel Sleeves on Cylindrical Grinding Machines" available without charge from Grinding Wheel Institute, Greendale, Massachusetts.

New Multi-head Abrasive-

- Now you can get this amazing new Engelberg Abrasive-Belt Grinder in 1, 2, 3, 4 — or any number of grinding heads!

- See a 4-Head Grinder at the ASTE Show — Booth No. 1221. A selection of other Engelberg Abrasive-Belt Grinders will also be demonstrated.

A COMPLETE LINE OF ABRASIVE BELT GRINDERS — ALL MADE AND SOLD BY —

ENGELBERG

Model BG8-FT9 WET-DRY SURFACER

For grinding large areas. Has automatic feed table.

Model BG8-Automat WET-DRY SURFACER

For mass production of small parts. Has built-in "conveyor".

Model 506 WET-DRY GRINDER

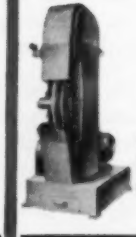
For quick free-hand surfacing, deburring, chamfering, rounding.

Model 648 DRY BELT GRINDER

A budget-priced 6" grinder that adjusts vertically or horizontally.

Model L4 CENTERLESS GRINDER

Handles wide range of work to tolerance of + .001 or less.



Model C6 CONTOUR GRINDER

Flexible abrasive belt runs over shaped contact roll.

Model B6W FLEXIBLE BELT

Flexible free belt grinds irregular contours.

Model WG4 PLATEN GRINDER

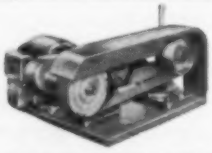
Grinds production runs of small parts to true flatness.

Model AG4 WET-DRY GRINDER

For all-around use or as low-priced auxiliary to larger machine tools.

Model B3 DRY BELT GRINDER

Used mainly for free-hand grinding and light stock removal.



Model BBS BENCH GRINDER

Does clean-up, deburring. Removes flashings, risers, etc.

Model 505 BACKSTAND IDLER

Combines high production speed with automatic belt tension economy.

Model AB5 BACKSTAND IDLER

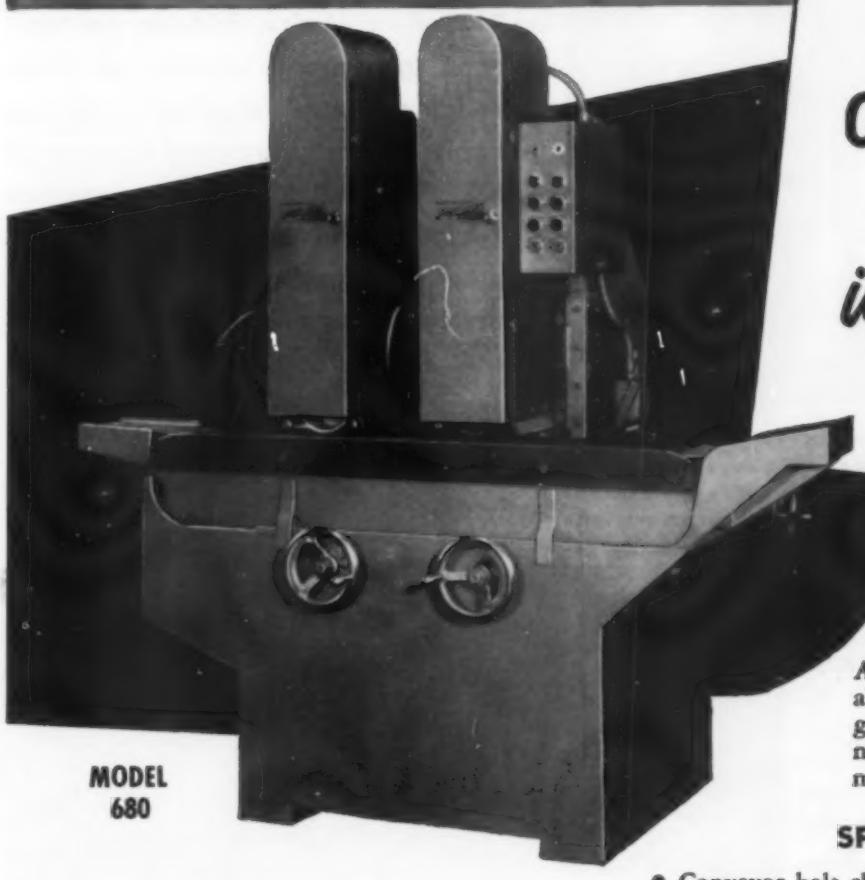
Converts grinding-polishing lathes to high output belt grinders.

Model CN2 UTILITY GRINDER

Grinds on contact wheel, platen or free belt — horizontal or vertical.

THE ENGELBERG
188 SENECA STREET,

Belt Grinder..... does Many GRINDING OPERATIONS in One Pass!



MODEL 680

GENERAL DESCRIPTION

A high-production, semi-automatic, abrasive belt machine for wet or dry grinding or polishing of ferrous or non-ferrous parts, plastics and other materials.

SPECIAL FEATURES

- Conveyor belt changed in less than 5 min.
- Conveyor belt tension adjusted by simple twist of handle
- Conveyor belt speed varied and set by quick, easy turn of a wheel
- Extra safety — machine won't start unless belt is tensioned

Easily set belt tension remains constant, can be adjusted as desired. Notice simplicity and ease of belt change.

SPECIFICATIONS

Overall Size—90" long x 51" wide x 90" high
Abrasive Belt Size—6" x 80"
Conveyor Belt Size—7" x 144"
Abrasive Belt Speed—5500 sfpm
Conveyor Belt Speed—variable from 5 to 30 fpm
Maximum Piece Capacity—4" high, 6" wide, any length

OPTIONAL ARRANGEMENTS

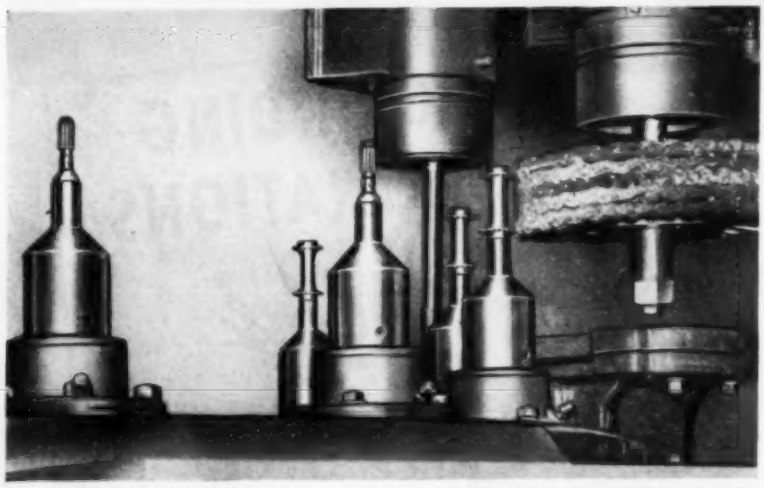
- Single, double or any number of heads
- 5 or 7½ hp drives
- With or without magnetic chuck

HULLER CO. Inc.
SYRACUSE, NEW YORK

Send us sample piece or print for cost—and time-savings estimate via the abrasive belt grinding way. Or ask to have one of our production engineers call to discuss your grinding problems. No charge—no obligation. Write for catalog.

Encircle No. 231 on postpaid card

Self-release, greater grip, automatic alignment of ERICKSON MANDRELS speed small to large part loading



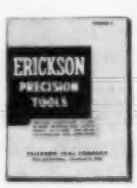
SMALL ERICKSON MANDRELS play a big part in holding down production costs for leading bicycle parts manufacturer. Here you can see how Erickson drawbar-operated, precision expanding mandrels speed wheel hub loading for buffing operation. Ease of operation and instantaneous release have greatly speeded this quantity production holding problem.

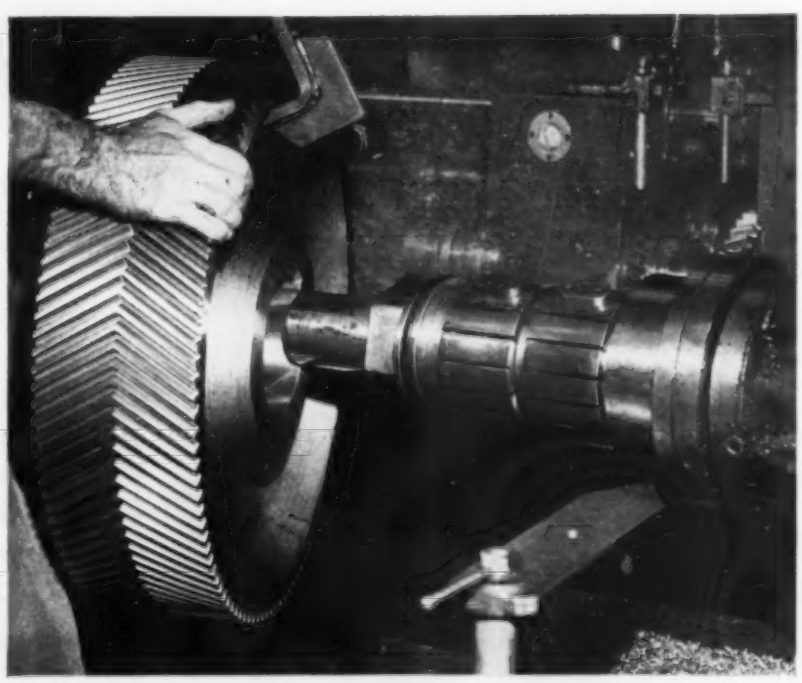
Regardless of size, Erickson precision expanding mandrels operate on Erickson's famous double-angle principle that not only assures guaranteed accuracy of .0005" T I R, but also makes mandrels self-releasing. They are available for air, hydraulic or manual operation. Special mandrel sleeves are designed to match various internal forms. AA-72

ERICKSON MANDREL ADVANTAGES

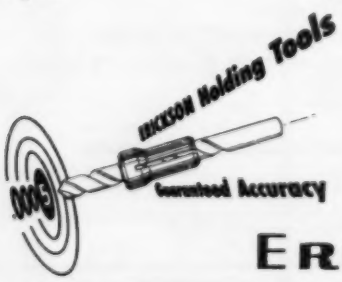
- Instantaneous self-release greatly speeds loading and unloading
- Greater holding power because grip extends over entire sleeve length . . . stops wobble and chatter
- Guaranteed accuracy of .0005" T I R
- Each sleeve covers a range of 1/32"
- Sleeves are interchangeable on mandrels of same series

Are you bothered by a tough internal holding problem? Then let us prove that Erickson mandrels speed production for lower unit costs. Give us a call today or write for catalog K.





ERICKSON MANDRELS speed large part handling, too. See how easily this heavy shovel gear, 24 inches in diameter, is being loaded for gear cutting at the Alten Foundry and Machine Works, Inc., Lancaster, Ohio. Larger shovel gears up to 61 inches in diameter are handled just as easily. At Alten Foundry, using an Erickson mandrel, loading and automatic alignment require only 10 percent of the time required by plants using solid arbors and arbor presses. Even this large mandrel is self-releasing. Operator fatigue is practically eliminated.



ERICKSON TOOL COMPANY

2310-3 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

See us at Booth 652 ASTE Show, Chicago, March 19-23

Encircle No. 232 on postpaid card

By **Edmund Mottershead,** President
Mottershead Associates
Chicago, Ill.

GRINDING safely

Operation OK, But . . .
Watch for Leg Burns . . .

MOST SMALL PORTABLE grinding machines operate at relatively high peripheral speeds. The lack of control, or the improper adjustment of speeds, particularly with air grinders, can result in considerable trouble. In some cases, these speeds are too high even for organic bonded high-speed wheels.

In the case of air-driven grinders, this may be caused by the governor getting out of adjustment or not functioning at all. There are cases on record of operators' removing the governor entirely in order to get more speed out of the machine. Portable power tools leave the factory ready to deliver the maximum power at the correct speed, but many times these values are not checked against machine performance thereafter.

One point to remember with portable air-driven tools is that the pressure indicated on the air gage at the compressor may be misleading. The pressure at the tool is more important, and may be quite different due to line loss, kinks, or other causes. Too high a pressure is dangerous, and too low a pressure causes loss of efficiency in the grinder.

Similarly, the delivered voltage should be checked frequently on high-cycle electrically operated machines. Portable tool manufacturers will gladly cooperate in supplying information on the proper operation and maintenance of their units.

The safe use of portable grinding wheels is dependent to a very large extent upon the condition of the equipment on which the wheels are mounted and upon the kind of treatment they are subjected to when in use. As a rule, the wheels used are strong in relation to the stresses present, and the factor of safety against wheel breakage is therefore high.

Although the accident frequency rate is low, the potential severity of injury which might result from wheel breakage is high, which makes it imperative that workmen be trained in correct and safe operation of their equipment. ● ●

Rough grinding with high speed pneumatic grinders using special reinforced resinoid disc is safe operation when performed correctly as shown. Wheel is flexible, but a light touch is required to avoid wheel breakage and insure maximum use of full cutting action of grit. Goggles with cups, of course.

Working fast from piece to piece, operators must take reasonable care to shut off power when not actually grinding; otherwise there is a possibility of cuts or leg burns resulting from brushing against the high speed edge of the grinding disc. Here, as elsewhere, grinding is safe when performed correctly.

for CARBIDE GRINDING use
PRECISION'S LO-TENS vitrified wheels

Because — for more than 10 years Precision has maintained its supremacy in the field of roughing and semi-finishing carbide tools of all types.

Because — competition and extravagant claims have challenged us constantly, but we're still "Tops."

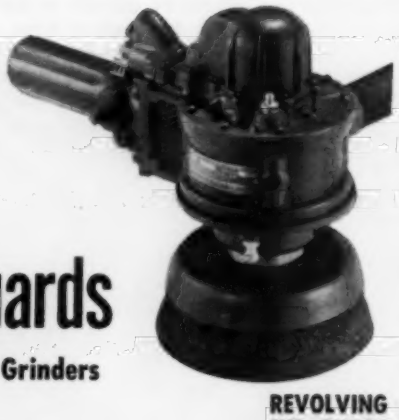
Because — generally a green (DC) wheel in Precision's improved 15 or 15F open structure will do your carbide grinding better, quicker, cooler, and more economically.

Prove to yourself! **TRY**
grinding the PRECISION way makes precision grinding pay

PRECISION
GRINDING WHEEL COMPANY, INC.
8301 TORRESDALE AVE. • PHILADELPHIA 36, PA.

Encircle No. 233 on postpaid card

MORRISON
MAKES
90%
OF ALL
Wheel Guards
Used On Portable Grinders



REVOLVING CUP GUARD

MORRISON Guards are designed for greatest safety, lightest weight, maximum strength and lowest cost.

All Morrison Guards have been developed in collaboration with the Safety Committee of the Grinding Institute.

A MORRISON GUARD For Every Portable Grinder Built— ***Write today for Literature.***

MORRISON PRODUCTS INC.
16816 Waterloo Road **Cleveland 10, Ohio**

Encircle No. 234 on postpaid card

NOW... get Hartford's famous
TRIPLE ACTION
in
fully enclosed
cutting barrels

There's a new look in Hartford's Tumbling Barrels....but underneath you get the famous Triple Action Barrel originated by Hartford and unsurpassed for doing a better job ...faster...at lower cost.

Compare these advantages! **The Hartford fully enclosed Model 1956 is extremely compact . . . requires less floor space than most enclosed barrels. With Hartford the power unit is on top, where it belongs for long life, cleanliness and ease of maintenance. Barrel is mounted on rugged "A" frame for maximum strength. Streamlined steel enclosure confines splash and contributes to safe operation. Pivoted front guard opens to permit quick, easy loading and unloading . . . plus easy removal of barrel assembly. Standard power unit has four speed gear shift transmission. Literature and prices promptly furnished.**

Hartford
PRECISION BALLS • RETAINERS
BEARINGS • TUMBLING BARRELS

HARTFORD STEEL BALL CO., INC., 21 Jefferson, W. Hartford 6, Conn.

Encircle No. 235 on postpaid card

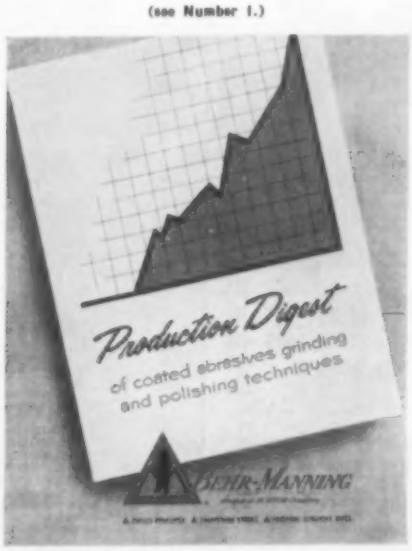
Available Literature

Catalogs and Bulletins Available from Manufacturers

For copies of the literature in which you have an interest use the postage-paid postcard. Merely circle the identifying number and mail the postcard.

1. Coated Abrasives. A 60-page "Production Digest" of authoritative papers on coated abrasive grinding and polishing techniques, has just been published by Behr-Manning Corp., Dept. PD-54, Troy, N.Y., to "help industry solve modern grinding and polishing problems and suggest new practical methods." The authors include E. E. Oathout, Dirck Olton, J. J. Durnan, J. Karl McLaughlin, Dr. H. N. Dyer and H. L. Bennett.

(see Number 1.)



2. Centerless Finishing Machines. Literature is available from Production Machine Co., Dept. GF, Greenfield, Mass., describing and illustrating their Four Eighty Four centerless finishing and polishing machine. A variety of finishes can be obtained on these machines using abrasive, felt, leather or fabric belts. Simplicity of operation permits the use of comparatively unskilled labor, thereby reducing costs.

(see Number 2.)

HANCHETT

MODEL DN

knife grinder

NEW! *fully automatic — low priced*

KNIFE CAPACITY — 32" to 108"

MODEL DN FEATURES:

1. Timing belt drive. Positive — quiet — non-slipping.
2. Eliminates all gears (Requires no lubrication).
3. Free from vibration and reversal shock.
4. 100% Anti-Friction Bearings.
5. Precision ground ways for accuracy.
6. Guarantees perfect machine alignment.
7. Force feed lubricated ways.

Other models

AK EXTRA HEAVY DUTY

GK HEAVY DUTY

FINEST KNIFE EDGES

Write for complete information

HANCHETT MANUFACTURING COMPANY

World's Largest Manufacturer of Knife Grinding and Saw Sharpening Machinery

MAIN OFFICE — Big Rapids, Michigan **WEST COAST** — Portland, Oregon

HANCHETT GRINDERS BIG RAPIDS MICHIGAN

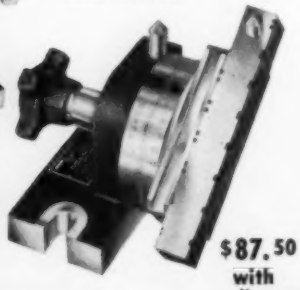
Encircle No. 236 on postpaid card

now

TWO NEW VERSATILE TOOLS

FOR ECONOMICAL DRESSING — The G-5 radius dresser is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal gives chatter free operation that may be set to the exact radii desired.

$80.00 with diamond



$87.50 with diamond

A LOW COST DOUBLE DUTY TOOL— The G-2 angle dresser and tool holder is actually 2 tools in one, having an easy to read *vernier* scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc. on any desired angle.

PLUS FREE HANDY STORAGE BOX.

$149.50 COMBINATION PRICE FOR BOTH TOOLS WITH DIAMONDS.

Send your order direct but include the name of your distributor.

DISTRIBUTORS WANTED. Write for complete information.

ROTHFUSS TOOL CO.

Box 202 Elmwood Station • Providence 7, R. I.

Encircle No. 237 on postpaid card

NEW! *craftool*

DUSTMAN takes the dust out of shopwork... AT THE SOURCE!

Attaches to any machine!

MODEL 711

only **$89.50**

complete with ⅓ HP ball-bearing motor, hose, fittings, switch and hood. (Waste can not included)

4-wheel Dolly $9.50

Model 811 supplied with fibre drum (not adaptable to metal waste can) $89.50

See what a difference DUSTMAN will make in your plant — no more messy, littered floors, no more wasting expensive overtime on hours of cleanup. Just connect DUSTMAN to any machine—and it gathers up all sawdust, wood chips and shavings the instant they're formed. Then it discharges them into a waste can—and your shop is clean, the air healthfully pure and dust-free.

DUSTMAN can also be used as an exhaust system or as a heavy duty vacuum for cleaning shop floors. Specially designed 8" pressure blower has the power to pick up large debris that an ordinary vacuum can not. Sturdily constructed with no exposed parts . . . quiet running . . . no greasing or oiling necessary. At its low price there is no need to deprive your plant of the great convenience and cleanliness that DUSTMAN affords.

Perfect for Saws—Sanders—Multi-Purpose Tools—Radial Saws—Portable Tools, etc.

- **FITS ON AN ORDINARY WASTE CAN!**
- **PLUGS INTO ANY AC OUTLET!**
- **COMPLETELY PORTABLE — MOVE IT FROM MACHINE TO MACHINE WHEN NEEDED!**

SEND FOR COMPLETE CATALOG G

CRAFTOOLS, INC.

401 BROADWAY • NEW YORK, N. Y.

Encircle No. 238 on postpaid card

3. End Mill Grinder. A new brochure published by William H. Field Co., Inc., Dept. FF, 323 Dorchester Ave., Boston 27, Mass., describes and illustrates their Centra-Point end mill grinder. This grinder is specifically designed for sharpening end mills, shell end mills, chucking reamers, and small milling cutters. It is said to reduce sharpening set-up time and produce excellent work even with unskilled operators. Specifications and accessories are included in this brochure.

4. Adhesives, Coatings, Sealers. A new 12-page illustrated catalog listing properties and applications of a wide variety of adhesives, coatings and sealers is available from Adhesives and Coatings Div., Minnesota Mining & Mfg. Co., Dept. F, 411 Piquette Ave., Detroit 2, Mich. Typical applications in the metalworking, transportation, general manufacturing, electrical manufacturing and building products industries are listed in comprehensive table.

5. What You Should Know About the 'Golden Treatment' on Sisal Bluffs, is the title of a new pocket size manual available from American Buff Co., Dept. GG, 2414 S. LaSalle St., Chicago 16, Ill. An actual sample of sisal yarn with only one end chemically treated is featured in this booklet available free to buff users. Booklet concisely explains why sisal and cloth require this exclusive new process.

6. Wheel Forming Attachment. Pratt & Whitney Div. of Niles-Bement-Pond Co., Dept. FG, West Hartford 1, Conn., has literature available describing and illustrating the Diaform wheel forming attachment. This attachment is designed for faster and more economical forming and re-truing of complex forms on grinding wheels. This is a lightweight, portable instrument that provides a simple method of truing complex forms in minutes.

7. Wet Tool Grinder. The Model H 30 inch wet tool grinder is described and illustrated in literature available from J. G. Blount Co., Dept. G, Everett, Mass. These grinders have a Timken tapered roller bearing pillow block with constant oil flow, a combination tool rest and wheel dresser, quickly regulated circulating water system with handy remote control, and a special air-flow motor base. Dimensions and specifications are also given.

8. Wheel Dressers and Cutters. Catalog No. 53R, available from Curtin-Hebert Co., Inc., Dept. GR, Gloversville, N.Y., describes and illustrates their line of grinding wheel dressers and cutters. The company specializes in the design of special cutters for special wheel dressing requirements, and special cutters for brick cleaning, concrete surfacing, flue cleaning, etc.

9. Rotary Lapping Machine. Model No. SPL-9A rotary lapping machine called the Spiralap, is described and illustrated in literature available from Diesel Control Corp., Dept. FF, 226 N. Marine Ave., Wilmington, Cal. This rotary flat lapping machine is designed to give the operator the greatest flexibility toward semi-automatic lapping of flat surfaces.

10. Surface Grinders. A new grinder catalog describing and illustrating the design and construction of the complete line of seven models from 6″x18″ to 10″x30″ is available from The DoAll Co., Dept. G.F., Des Plaines, Ill. These machines are said to take the guesswork out of surface grinding by grinding accurately to handwheel settings permitting production line grinding without constant checking of work.

(see Number 5.)

11. Shuttle-Drive Conveyors. A new 4-page bulletin is available from the Industrial Filtration Co., Dept. SD-478, Lebanon, Ind., describing and illustrating Delpark shuttle-drive conveyors for all material handling. Complete technical details on this new type oscillating conveyor for industrial applications are given. Units are available in stationary or portable models which are hydraulically and mechanically operated.

12. Tool Grinder. Bulletin 46853 available from Ex-Cell-O Corp., Dept. GR, 1200 Oakman Blvd., Detroit 32, Mich., describes the Style 46-D tool grinder for the efficient sharpening of single-point tools, carbides, cast alloys and high-speed steels. It is a double-end grinder using six-inch plate type wheels for face grinding. Illustrations and specifications are included.

13. Permanent Magnet Separator. The Frantz Ferro-Filter, permanent magnet separator for the extraction of iron and steel particles and chips from circulating lubricating and hydraulic oils, coolants and cutting compounds is described and illustrated in a new bulletin avail-

(see Number 3.)

(see Number 4.)

(see Number 6.)

able from S. G. Frantz Co., Inc., Dept. F, Brunswick Pike and Kline Ave., P.O. Box 1138, Trenton 6, N.J. These separators are claimed to trap ferrous particles as fine as one micron.

14. Hydraulic Fluid. A new 8-page bulletin describing Houghto-Safe fire resistant hydraulic fluid has been released by E. F. Houghton & Co., Dept. GF, 303 W. Lehigh Ave., Philadelphia 33, Pa., manufacturers of oils, chemicals and packings. Bulletin contains factual information on installation and maintenance of this safe fluid where potential fire hazards exist. The importance of pumpability at low temperature and storage stability are also covered.

15. Enclosed Cutting Barrels. Literature describing and illustrating the line of Triple Action enclosed cutting barrels is available from Hartford Steel Ball Co., Inc., Dept. F, Hartford 6, Conn. These machines feature gear shift speed control; drum type reversing switch; magnetic starter and brake; accessibility of controls; 24 hour program timer; safety guard; drive chain; and full floor plate advantages. A pressure vent in the cover is also a safety feature of the machine.

16. Tap Grinder. A new high-production tap grinder, specifically designed for high production grinding of standard taps is described and illustrated in literature published by Jones & Lamson Machine Co., Dept. GF, Springfield, Vt. This machine is equipped with automatic work handling, magazine feed. It offers a wide range of work speeds for effective grinding on all tap sizes from 0 to ⅜" diameter. Specifications are also included.

17. Surface Roughness Gage. Micrometrical Mfg. Co., Dept. FF, 345 S. Main St., Ann Arbor, Mich., has literature available describing and illustrating the Profilometer type LJ tracer for measuring surface roughness. This new tracer will measure more than 85% of all the varied surfaces produced by industry, and measures all surfaces produced in many plants. It can be operated by Mototrace or by hand and can be used with any Profilometer Amplimeter and Mototrace.

18. Swarf Collecting. A new booklet describing the benefits of collecting swarf from diamond wheel grinding operations and salvaging the worn out diamond wheel stubs is available from Norton Co., Dept. RG, Worcester 6, Mass. This booklet includes such information as where swarf can be sent for reclamation, value of diamonds salvaged, and types of swarf which are acceptable for salvage.

19. "Tools That Created Civilization, Now Show The Way To World Peace" is the title of a new brochure available from the Wilkie Foundation, Dept. GF, Des Plaines, Ill. This brochure on civilization through tools colorfully illustrates man's progress through the years starting back in the stone ages.

20. Tumbling Media. Nylaslugs, a molded nylon tumbling media for precision barrel finishing of plastic parts and fragile parts of other materials are described in literature available from Rampe Mfg. Co., Dept. G, Cleveland, O. They are made of F-10001 injection mold nylon of double cone shape. This nylon is very hard and long wearing, and slightly abrasive in itself.

21. Electrolytic Shaping of Honeycomb Materials is the title of a new folder available from Anocut Engineering Co., Dept. RG, 631 W. Washington St., Chicago 6, Ill. This bulletin, No. 156, completely delineates the problems involved in shaping delicate honeycomb structures with ordinary grinding methods, and shows how Anocut equipment, by reducing the abrasive action 90%, produces clean sharp cell edges that are so necessary for obtaining a well-bonded "skin."

22. Centerless Grinding Fixture. A new illustrated bulletin describing the new S & E centerless grinding fixture is available from S & E Machine Products, Inc., Dept GG, Bridgeport, Mich. This fixture is a conversion unit which will convert any between centers grinding machine to a centerless grinder. Adapt-

Production CENTERLESS

TYPE 101
HIGH SPEED

GRINDING & FINISHING MACHINE

Bars and tubes given high polish at rate of 100 FEET PER MINUTE!

Production's type 101 High Speed machine shown here in tandem regularly produces up to 100 feet of highly polished steel bar or tube stock per minute prior to chrome plating. Buffed surfaces on aluminum or other non-ferrous metals can be provided with equal ease.

These versatile machines can accommodate work up to 4" in diameter for abrasive belt finishing, buffing, or a combination of both.

Our Demonstration Laboratory is ready to process a sample lot of your material. Write Dept. C today for complete details.

PRODUCTION MACHINE CO., Greenfield, Mass., U.S.A.

Encircle No. 239 on postpaid card

able to through feed, in-feed, plunge or form grinding, the unit is light in weight and can be easily set up or dismounted on existing machines.

23. Diamond Turner. Literature describing and illustrating the new Turnit diamond turner is available from Wheel Dressing, Inc., 8720 W. Chicago, Dept. RG, Detroit 4, Mich. Turnit rotates the diamond tool manually or automatically presenting at predetermined intervals a new sharp face of the diamond to the grinding wheel. The rotation of the diamond tool eliminates excessive diamond heat and pressure and increases diamond tool life by at least 50%.

24. Grinding Spindle. Literature is available from Wyzenbeek and Staff, Inc., Dept. GF, 223 N. California Ave., Chicago 12, Ill., introducing a new type of grinding spindle which is more convenient than a conventional tool post grinder. The set up is made with the spindle only, and the flexible shaft motive power is not coupled up until ready to grind. It is available in three sizes to accommodate grinding wheels up to 5" in diameter. Each size is equipped with a Wyco quick change attachment for snapping on and off the shaft of a Wyco flexible shaft grinder.

25. Disc Grinders. A new condensed catalog describing various types of disc grinders is available from Besly-Welles Corp., Dept. FF, Grinder Div., Beloit, Wis. Dimensions and specifications are listed for the double horizontal and double vertical spindle disc grinder, radial head face grinder, single vertical spindle disc grinder, and many special grinders which easily adapt to unusual grinding jobs.

26. Coolant. A bulletin describing two products of the Cutting Tool Mfg. Div. of the Motch & Merryweather Machinery Co., Dept. F, 1250 E. 222nd St., Cleveland 17, Ohio, is available. Triple C grinding coolant, is now available in a new form, namely liquid, having initially been introduced in crystalline form only. Triple C Machine Cleaner, a new product, has been developed for the express purpose of dissolving accumulations of insoluble soaps and similar deposits in the coolant systems of machine tools.

27. Automatic Grinder. The No. 18C Blanchard grinder, introduced at the Machine Tool Show, has been developed over a period of seven years. It is said to accomplish by means of automatic cycle control, most of the operations ordinarily performed by the operator when running a standard No. 18 grinder, including the most important item of size control. On suitable work, it is said a tolerance of ±.0005" can be held in regular production. The Blanchard Machine Co., Dept. FG, 64 State St., Cambridge, Mass.

28. Pivot Polishing is the title of a new 40-page booklet which describes the process of sizing and finishing high precision shafts and pivots. Included is much valuable data which is not readily available in standard hand books. Also described are the Hauser pivot burnishing machines. Carl Hirschmann Co., Inc., Dept GG, 30 Park Ave., Manhasset, N.Y.

29. Pocket Tumbling Units. An illustrated data sheet describing multiple pocket units of tumbling barrels for small scale deburring, defining, precision surface finishing, and burnishing, is offered by Tumb-L-Matic, Inc., 4510 Bullard Ave., New York 70, N.Y. The advantages of pocket tumbling units for model makers and other industries that require the tumbling of small parts, are outlined. Both the submerged type and the self-contained type are described and illustrated. Specifications and dimensions are also given.

30. Aluminum Oxide Flours. Literature is available from K. C. Abrasive Co., Dept. F, P.O. Box 4335, 3101 Perry Ave., Kansas City 27, Mo., describing their precision graded aluminum oxide flours, for lapping, honing and polishing operations where precision and uniformity are a must. Samples and prices are available.

Hanchett Magna-Lock Magnetic Chuck at Turchan Follower Machine Co.

REDUCES SETUP TIME 66.6%

THE JOB: Milling hard cast iron gibs, 1⅜" maximum width, variable lengths, 60° compound angle, .250" taper per foot. Roughing cut: 1⅜" max. width, 0.200" depth. Finishing cut: 1⅜" max. width, 0.050" depth. Spindle speed: 385 RPM. Cutter: 8-flute carbide tip 3" dia. Table speed: 15 IPM—20 IPM. Stock removal: Approximately 4 cu. in. per min. Fixture: mechanical.

THE PROBLEM:

1. Fixture setup time and handling was 60 minutes plus time required to layout, drill and tap holes in the gibs to coincide precisely with the bolts of the fixture. Spacing varied between 9" and 10" at several intermediate increments.
2. The holes were not functional parts of the gibs, being used only to hold the gibs while being milled.
3. Because of the several milling operations, the gib had to be removed each time and re-bolted to the fixture.

THE SOLUTION: A Hanchett MAGNA-LOCK Magnetic Rectangular CHUCK positioned on a sine bar, the milling machine cutter spindle being swiveled to the corresponding angles.

THE RESULT:

1. FIXTURE SETUP AND HANDLING TIME—20 MINUTES.
2. Layout, drilling and tapping operations eliminated.
3. Time required to re-bolt gibs on fixture for each operation eliminated.

You, too, can increase your machines' productivity with Hanchett Magna-Lock Magnetic Chucks and Devices. Take advantage of Magna-Lock's experience and engineering know-how—at your service to help solve your holding problems. Magna-Lock is the only *exclusive* manufacturer of magnetic chucks and devices.

WRITE TODAY, Dept. GF-36

Request Magna-Lock as original equipment on your new machines.

Magna-Lock

Hanchett MAGNA-LOCK CORPORATION

Magnetic Chucks and Devices

BIG RAPIDS, MICHIGAN, U.S.A.

Encircle No. 240 on postpaid card

Check and Compare!

NO OTHER LINE OF BARREL FINISHING EQUIPMENT OFFERS SO MANY EXTRA FEATURES

Take a minute . . . check SPEED-D-BURR *extra* features against your present finishing equipment—or compare with equipment you plan to install. No question about it . . . the total equals *more* dollar value when you buy—SPEED-D-BURR!!

36" x 32" BARREL UNIT

STANDARD EQUIPMENT	SPEED-D-BURR				
BARREL CAPACITY (Nearest comparable unit)	15.8	13.0	13.0	14.5 (Optional)	13.8
BARRELS (Rubber or Neoprene Lined)	Yes	Yes	Yes	Yes	Yes
HINGED BARREL DOOR (Speeds open and close time 90%)	Yes	No	No	No	No
QUICK ACTING CAM LOCKS (Opened without tools)	Yes	Yes	Yes	Yes	No
MODERN, STREAMLINED CABINET	Yes	Yes	Yes	No	No
CABINET PANELS (Extra heavy gauge steel-integral part of supporting member (not light sheet metal wrapper)	Yes	No	No	No	No
COLOR ENGINEERED CABINET (For safe and fatigueless operation)	Yes	No	No	No	No
MOTOR SIDEMOUNTED AND COVERED FOR PROTECTION	Yes	No	Yes	No	No
vari-SPEED MOTOR	Yes	No	No	No	No
LOW VOLTAGE CONTROLS RECESSED AND SIDE MOUNTED FOR SAFETY	Yes	No	Yes	No	No
PRESET STOP AND START TIMER	Yes	No	No	No	No
DIRECT READING TACHOMETER	Yes	No	Yes	No	No
POSITIVE STATIC BRAKE	Yes	No	No	No	No

TOTAL = More dollar value with SPEED-D-BURR!

THE **FUTURAMA** SERIES
Custom Styled for **MODERN INDUSTRY**

SPEED-D-BURR CORPORATION — PRECISION BARREL FINISHING — DESIGNERS • ENGINEERS • MANUFACTURERS

MT-52

THE WORLD'S MOST COMPLETE LINE OF PRECISION BARREL FINISHING EQUIPMENT & SUPPLIES

Write for catalogs on:
SPACE MISER
FUTURAMA LINE
MITY-MITE LINE
HANDLING EQUIPMENT
MEDIA AND COMPOUNDS

Service is our most important product . . . Use it!

SPEED-D-BURR CORPORATION
3613-A San Fernando Road, Glendale 4, Calif.

Encircle No. 241 on postpaid card

Aget offers more! Over 38 standard Dustkop models to choose from . . . *Plus* engineering service to help you select, provide, and install the proper accessories and fittings to complete your dust collecting system. Write for illustrated folder . . . Today!

AGET MANUFACTURING COMPANY
1380 E. CHURCH STREET • ADRIAN, MICHIGAN

Encircle No. 242 on postpaid card

CUT-OFF Wheels . . .

for Metal and Non-metal

This complete line of Bullard Resinoid Bonded wheels offers a choice of many sizes and styles for all kinds of cutting jobs. They're strong, have high resistance to breakage and a low wear ratio. Made by the specialty manufacturers of cut-off wheels for over 25 years.

Write for new net price list.

BULLARD — *Geo. H. Bullard* COMPANY INCORPORATED
HOPKINTON ROAD · WESTBORO, MASSACHUSETTS
SPECIALTY MANUFACTURERS OF RESINOID BONDED HIGH SPEED GRINDING, CUT-OFF AND COPING WHEELS

Encircle No. 243 on postpaid card

aluminum oxide flours | **precision graded**

to micron sizes in grade Nos.
280
320
400
500
600
800
1000
1200

For lapping, honing and polishing operations where precision and uniformity are a must.

"MICRO-GRADED" ABRASIVES manufactured by:

K. C. ABRASIVE COMPANY
P.O. Box 4335 — 3101 Peery Ave.
Kansas City 27, Missouri
Write for prices and samples

Encircle No. 244 on postpaid card

What's New in Equipment and Materials

Chromium Carbide Gage Blocks Maintain Accuracy to .0000001 of an Inch

By **Jack Kenyon**
Associate Editor

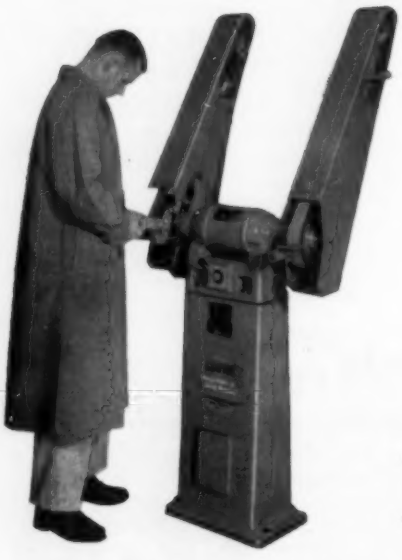
Recently developed gage blocks which are said to last thirty to fifty times as long as hardened steel blocks in highly abrasive shop conditions should be of interest to many grinding men. Made of chromium carbide, one of the newer members of the cemented carbide family, their properties made them ideal for hard usage in grinding shops.

More and more attention is being focused on the subject of gage blocks these days as grinding departments are called on to work to closer tolerances than ever before. The frontiers of gage block accuracy have been pushed into the seventh decimal place (tenth of millionths) in order to give industry the precision needed. This accuracy has required the attention of measurement experts around the world, and their cooperation across international barriers has been remarkable.

Durability has been the main problem in the use of gage blocks in grinding departments. In the highly abrasive environment of grinding and lapping shops, hardened steel blocks just haven't been able to hold size satisfactorily. Replacement costs have run very high.

Grinding shops are finding that chromium carbide gage blocks are ideal for their operations. Photo courtesy of Pipe Machinery Company of Cleveland.

CURTIS
feature machine of the month



Model DBA-1

ABRASIVE BELT GRINDING and POLISHING MACHINE

Bench or Pedestal Type

Abrasive Belt Arms Swivel 360°

Floor Space Only 2′ x 3′

High Speed — Cool Cutting

Positive Belt Tracking

Constant Belt Tension

completely universal operation

Quick Belt Change

AVAILABLE FOR 30 DAYS FREE TRIAL

PRICE $395.00

There is a Curtis Machine for every abrasive belt grinding and polishing operation. *You are invited to use our complete sample lab*

FOR GREATER ECONOMY IN PRODUCTION

CURTIS MACHINE CORPORATION

JAMESTOWN, N. Y.

THE BEST START for a QUALITY FINISH

Encircle No. 245 on postpaid card

IT TAKES LESS TIME TO
MICRO-FINISH HARD MATERIALS WITH

ELGIN DIAMOND

Color Identified for Positive Use
Grades for Every Purpose
Use Any Standard Finishing, Polishing or Lapping Technique
Ready to Use, No Mixing
Finish with diamond... Elgin Diamond!

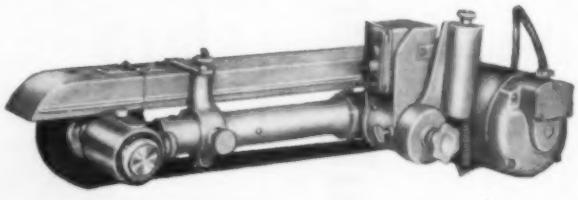
This booklet will help you Write for your free copy now!

See pictures of Elgin diamond in application ... gives details of method, grades to use and time required. Write today!

ABRASIVES DIVISION
ELGIN NATIONAL WATCH COMPANY
Dept. A-1
ELGIN, ILL.

Encircle No. 246 on postpaid card

THE G & P 6-72 BELT UNIT



Adaptable for almost every type of belt grinding and polishing

ADAPTABLE: 1. it is simple in design, lends itself to changes and elaborations; 2. it has a capacity for finishing large and small pieces; 3. can be used as both a primary or an auxiliary component of machines; 4. it is a machine in its own right; 5. it has mobility; and 6. it can be used for off-hand finishing or mounted to obtain accurate dimensions. Write for Bulletin No. 104 for full details.

Makers of the famous MARSCHKE grinders and buffers.

Grinding and Polishing Machinery Corp.
SUCCESSORS TO VONNEGUT MOULDER CORPORATION
2530-B WINTHROP AVE., INDIANAPOLIS 5, INDIANA

Encircle No. 247 on postpaid card

But developments during the past few years, including the introduction of chromium carbide, are reducing gage block replacement costs appreciably.

A good gage block material should have a thermal coefficient of expansion comparable to that of steel, since temperature variations in most shops are an important factor in gage block use. It must be very stable dimensionally and must be corrosion resistant. Then, among economic considerations, it shouldn't be too expensive as a raw material or too difficult to finish to the low-microinch-rms surfaces that gage blocks must have.

Chromium carbide appears to be an ideal gage block material. The Webber Gage Company, 12911 Triskett Rd., Cleveland 11, O., in cooperation with carbide manufacturers pioneered in bringing chromium carbide into use, and about two years ago blocks made of the material became a production reality. Their introduction to industry and their present price range are the result of great advances in the difficult job of producing the raw material and in the design of new machinery to produce the blocks.

Just how good are the new chromium carbide gage blocks? Well, the Webber Gage Company's own laboratory master blocks are made of the material. They have been calibrated by the Bureau of Standards to an accuracy of one-tenth of a millionth of an inch, (.000-0001") and the dimensional stability of chromium carbide assures them of the blocks' continuing accuracy. Webber has also furnished many of its clients with lab master blocks of the new material. Their highest-priced line, known as Webber Laboratory Master Croblox, are of chromium carbide.

Chromium carbide's hardness is 88 Rockwell A, giving extreme abrasion resistance. Corrosion resistance is approximately thirty times that of 18-8 stainless steel. Thermal coefficient of expansion for chromium carbide is 4.75 millionths of an inch per inch of length per degree F, at a temperature range of (64°-74°), which closely approximates steel's 6.45 millionths (SAE 1095). The blocks are also light in weight, since chromium carbide's density is 7.0 gms/cm^3, as compared with 7.8 gms/cm^3 for steel.

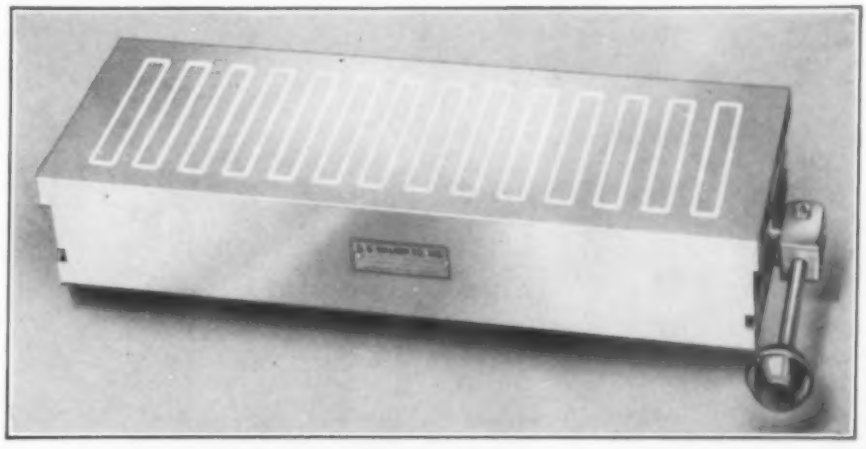
GRINDING AND FINISHING talked with a number of grinding shop users of chromium carbide gage blocks who have had them since they first became available. All reported that the blocks have been given hard use without the benefit of special care or lubricants, and that they show no appreciable wear. One grinding department user reported that his shop formerly used a number of sets of hardened steel blocks in conditions which made it necessary to replace one set of his blocks every week. His two sets of chromium carbide blocks have been in daily use for two years without measurable wear. Another user reports that he is particularly impressed with the wringing action of his blocks. The surface finish of his blocks has remained in its original condition despite rugged conditions of use, with only routine care.

The economies of using chromium carbide blocks where conditions are especially rough can be appreciated from the above examples, which show that the material's resistance to wear more than offsets their first cost. •

Use HANDY Postpaid Card. Encircle No. 102

Walker Chucks

You May As Well Have the Best



Pioneer in the making of magnetic chucks, Walker engineers have the know-how to produce chucks that have the proud distinction of being the best in the world.

Walker Permanent Rectangular Chucks are made in nine standard sizes from 4" x 8" to 12" x 24" and larger for special applications.

Walker Rotary Chucks are made in nine sizes from 4" to 16" standard diameter and larger sizes such as 48" diameter, the largest in the world.

Swiveling Chucks are made in three sizes from 4" x 8" to 8" x 24".

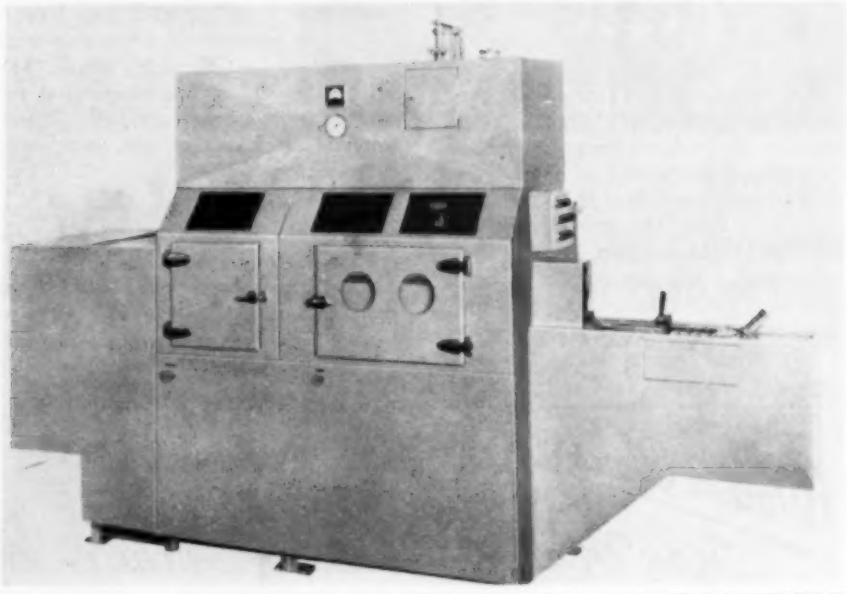
O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

Encircle No. 248 on postpaid card

Automatic Unit Finishes Compressor Blades

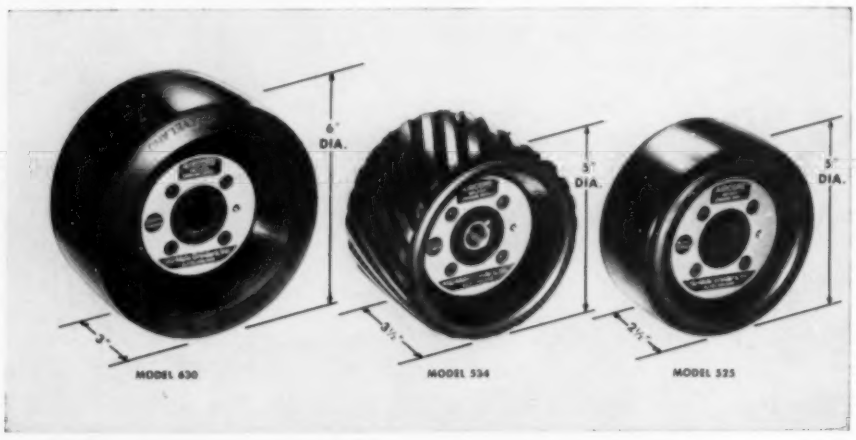


A new, automatic pressure blast wet blast unit for the finishing of jet engine compressor blades has been announced by The Cro-Plate Co., Inc., 747 Windsor St., Hartford, Conn.

Designed for a mid-western concern this unit is said to finish both sides of the airfoil section at the rate of approximately 200 per hour removing heat treat scale and discoloration without stock removal or distortion. The unit also incorporates a rinse facility for the removal of abrasive compound after blasting.

Blades are manually loaded on simple work holding fixtures which grasp at the root. A conveyor indexes blades into the blasting chamber where a series of moving guns actuated by an air hydraulic cylinder accomplish the finishing operation. Blades are then automatically indexed into the rinse cabinet and around to the original load section where they are manually unloaded. •

Use HANDY Postpaid Card. Encircle No. 103



New Aircore Grinding Wheels

cut faster . . . feature interchangeable contact drums

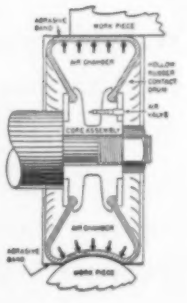
One universal core assembly and a range of contact drum sizes—these are the ingredients for a new line of Aircore Inflated Grinding Wheels. To change wheel sizes you simply change the drum. Complete changeover takes less than five minutes. All three models shown above are available with plain or serrated contact faces and can be used with all standard drive methods.

Because the contact area is always pliable, the wheel shapes itself to the contour of the work. Thus, you get up to 3,000% greater abrasive contact area than with hard-wheel grinders. This means a greater area finished with each pass.

As "set-up" wheels, Aircore Grinding Wheels provide complete uniformity of finish with no maintenance headaches. Inventories of buff sections, glue and grain are eliminated. Space required for the fabrication of conventional "set-up" wheels can be utilized for production work.

COMPARE AT OUR EXPENSE. Send for 25-day free trial. Give job requirements and type and size of power tool used.

N-113



The Aircore Inflated Grinding Wheel is built like an auto tire—flattens out at point of contact — contours to work surface.

NU-MATIC GRINDERS, INC.

8224 Carnegie Ave. Cleveland 3, Ohio

Encircle No. 249 on postpaid card

Copy Grinding Machine Grinds Two Identical Tools In One Operation

Recently introduced by the Carl Hirschmann Co., 30 Park Ave., Manhasset, N.Y., the new Copyrex copy grinding machine permits simultaneous grinding of two duplicate lathe tools, form tools, profile gauges, or production parts in one simple operation.

An easily made template, enlarged 5 times, effects the copying process through a parallelogram linkage to the twin tool holders holding the workpieces. A pair of diamond dressers keeps the wheels trued for accurate grinding. A cylindrical grinding attachment which permits grinding of circular pieces up to 4" in dia. is also available. •

Use HANDY Postpaid Card. Encircle No. 104

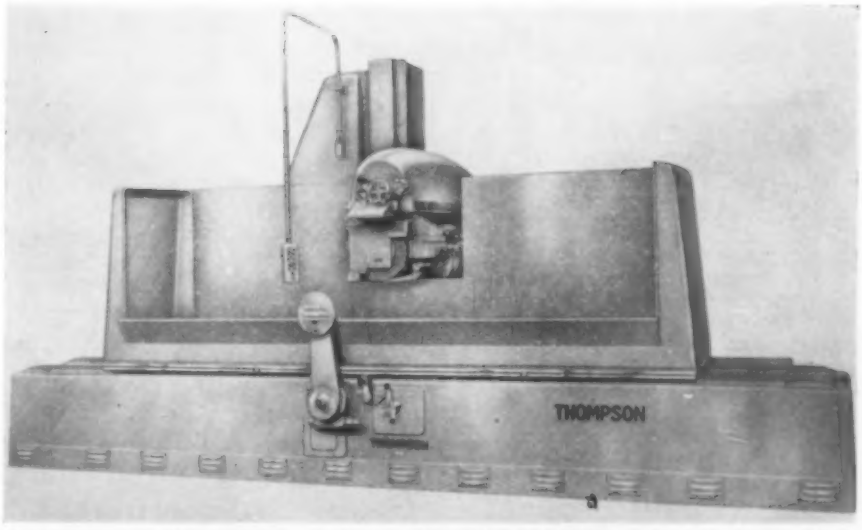
Heavy Duty Surface Grinders Combine Power, Precision

The Thompson Type CX hydraulic surface grinders, for heavy duty production, are massively built with heavy base and single column design, and are claimed to provide rapid removal of stock while maintaining close limits and fine finish.

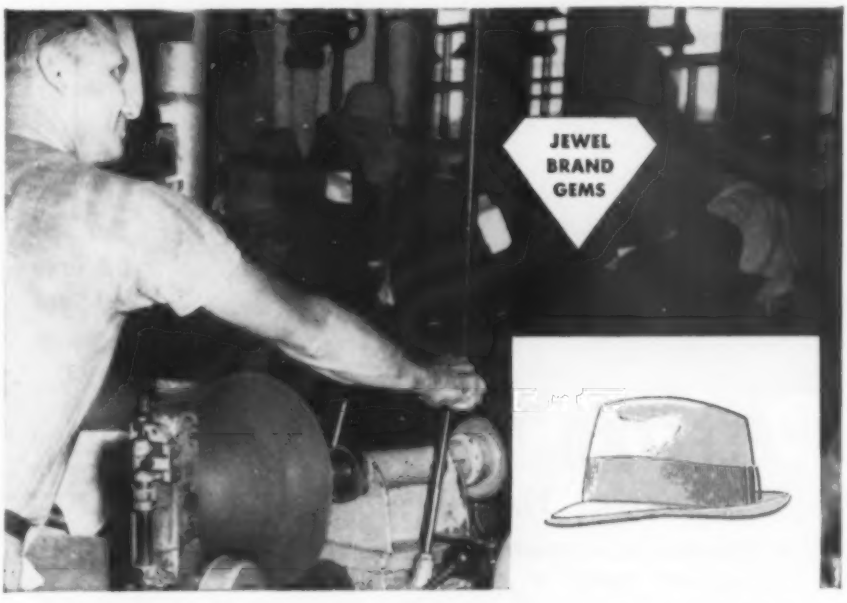
Features are: cross feeding wheelhead with horizontal spindle grinding with the periphery of a 20″ diameter wheel; rapid and accurate positioning of wheel to work; simplified, centralized control; flame hardened cross slide ways; in position wheel truing; direct-coupled motor drive to wheel spindle; low pressure hydraulic system; automatically lubricated ways, slides and spindle bearings; separate cooling system; way protection; anti-friction elevating nut; non-adjustable steel back silver lined front spindle bearings; simplified electrical control; manual cross feed; sizes from 30″ x 26″ x 72″ to 36″ x 36″ x 24″ (or larger).

Auxiliary equipment for the CX includes: automatic down feed; micrometer backup stop; dust exhauster attachment; coolant through wheel; angular wheel truing; auxiliary hand table feed; Hoglund Magniform contour dressers; coolant filter; magnetic coolant separators; wheel balancing ways and arbors; electric double angle wheel truing; manual fine cross feed; raised elevation; rectifiers and neutrolators for chuck; demagnetizing switches and motor generator sets; Delpark coolant filters. Thompson Grinder Co., 1534 W. Main St., Springfield, Ohio. •

Use HANDY Postpaid Card. Encircle No. 105



The Thompson CX hydraulic surface grinder illustrated is equipped with auxiliary raised elevation attachment and swinging pushbutton station. The size is 36″x48″x 120″. Table speeds of all CX's are 10 to 100 fpm with vertical feed hand wheel graduated to .0005 and powered at 15 ipm.



Maybe there's an idea for you in this STETSON finishing operation

Believe it or not, there *is* some roughness in hat fur. To remove it, STETSON employs abrasives . . . not just ordinary abrasive because STETSON HATS are not ordinary hats . . . STETSON concentrates on JEWEL BRAND POUNCING PAPER. There's a good reason for this. JEWEL BRAND POUNCING PAPER is razor sharp. It cuts clearly without dragging, and is both flexible and durable. For an operation that requires a very light touch, JEWEL BRAND POUNCING PAPER solves a problem precisely.

You may have some finishing problem where the AP experience involved in this application would be helpful and profitable. AP experience covers a broad range because of the broad range of abrasives AP Manufactures. You can get the benefits of this experience without obligation. Just call on an AP engineering specialist. Write Abrasive Products, Inc., 517 Pearl Street, South Braintree 85, Massachusetts.

Abrasive Products, Inc.

SOUTH BRAINTREE 85, MASSACHUSETTS · MAKERS OF JEWEL COATED ABRASIVES

Encircle No. 250 on postpaid card

REPRINTS AVAILABLE

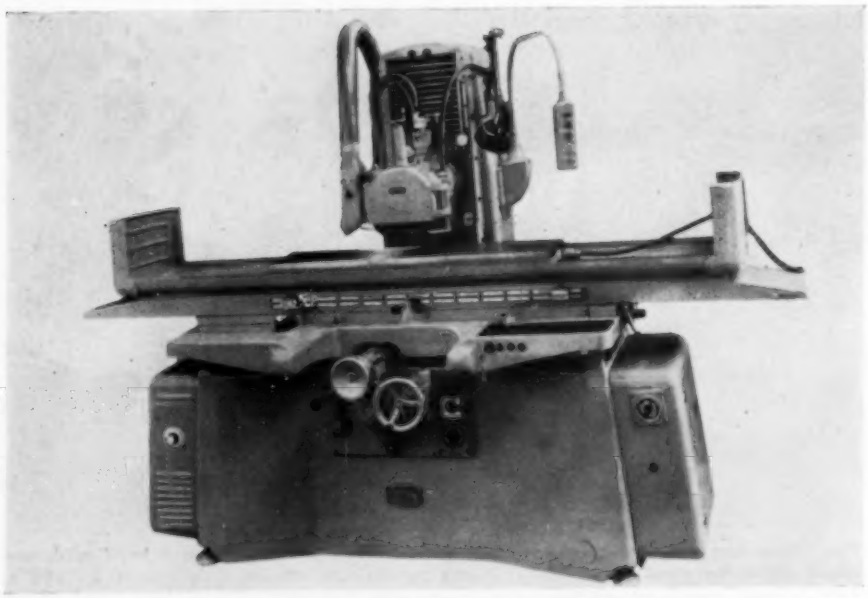
A few reprints of articles which have appeared in previous issues of GRINDING and FINISHING are available:

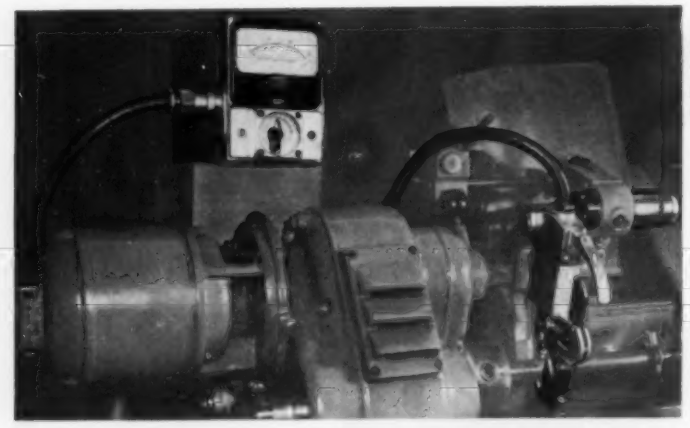
Abrasive Grains, by Joseph J. Forrester.

What Is the Smallest Radius That Can Be Dressed With a Wheel Dresser? By Henry F. Swenson.

Where and How You Can Use Abrasive Rolls, by Robert McAdams and James L. Erickson.

Available at no charge from GRINDING and FINISHING, 222 East Willow Ave., Wheaton, Ill.





EAM MODEL "L" SERIES GAUGES

Set up in three minutes easy as A-B-C

"ELECTRO-AUTOSIZER"

Automates Your Grinder . . .

- **Dictates size of workpiece independently of machine variation**
- **Electronic meter constantly indicates size—taper**
- **Controls wheel action automatically**

The EAM Electro-Autosizer is accurate to better than half of one ten thousandths (.00005") over a range of ⅛" to 5" O.D. regardless of vibration or rotation speed of workpiece.

Ruggedly constructed—defies constant exposure to coolant water, grinding dust, etc. New electronic principle makes unit drift-free and wear-free.

Even in the hands of the semi-skilled, the Electro-Autosizer brings super-precision right to the point of production. WE WILL GUARANTEE TOLERANCES AS CLOSE AS HALF A TENTH (.00005").

Combines inspection with production—cuts costs all down the line.

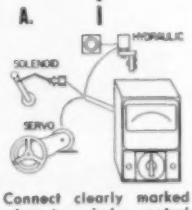
for complete information and prices write to . . .

E.A.M. **ELECTRO-AUTOSIZING MACHINE DIVISION**

Industrial Gauges Corporation 40-A W. Englewood, N.J.

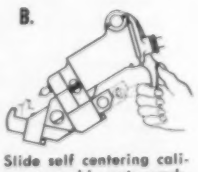
Encircle No. 280 on postpaid card

A.



Connect clearly marked wires to grinder control elements. Plug control box into any power outlet.

B.



Slide self centering caliper assembly onto workpiece and lock.

C.

Dial your size.

Surface Grinder Accurate to .00004"

Adjustment accuracy to 0.00004" is featured in the Blohm hydraulic surface grinders now distributed by the Aaron Machinery Co. of New York City. The exclusive Microtip in-feed and depth-feed control on these large capacity grinders gives automatic push-button depth feed of 0.00004" and cross feed of 0.0002", after a rough hand adjustment.

The model HFS-12 illustrated here has a grinding capacity of 14" wide by 48" long. Four other models range in capacity down to 14"x18", with model HFS-510 featuring 18" wide x40" long capacity. Each model has a 5 hp two-speed motor mounted directly on the spindle, "oilmatic" type adjustable tapered bearings in the spindle, and rugged table and saddle mounted on ball bearing assemblies operating on hardened precision ground chrome-nickel-steel ways. These table and spindle features combined with unusually sturdy over-all construction practically eliminate vibration and help insure maximum precision. Wheels up to 4" wide can be used in conjunction with a cross feed up to 2½" per stroke for greater production and efficiency at lower cost.

The various models can also be furnished with an optional "Finimatic" device to give a completely automatic grinding capacity, with the machine stopping itself after three idle runs. For further information, write Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N.Y. •

Use HANDY Postpaid Card. Encircle No. 133

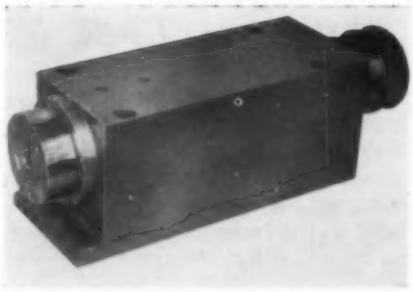
New Line of Grinding, Milling and Boring Spindles

Several new Pope precision spindles of particular interest to tool engineers were exhibited by Pope Machinery Corporation's Chicago Representatives, Federal Machinery Sales Co., at Booth No. 392, ASTE Show.

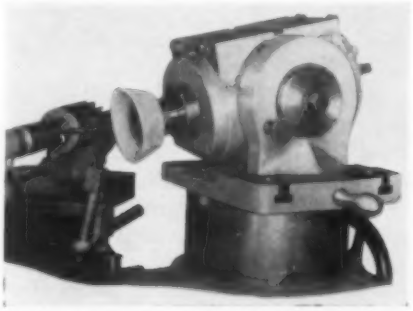
On display were the new Pope Super-Precision, heavy duty boring spindle which is capable of boring holes round within millionths of an inch and which comes in both belt and motor driven types covering a wide range of speeds and horsepower.

Other new Pope Spindles are the high cycle, totally enclosed, water cooled oil mist lubricated, motorized spindles for super-precision, heavy duty grinding and milling at speeds up to 100,000 RPM.

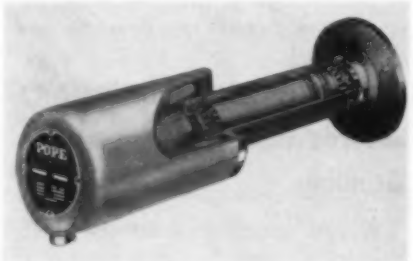
The popular and widely used motorized 1 hp, 3600 rpm totally enclosed, non-ventilated, dual voltage, 3 phase,



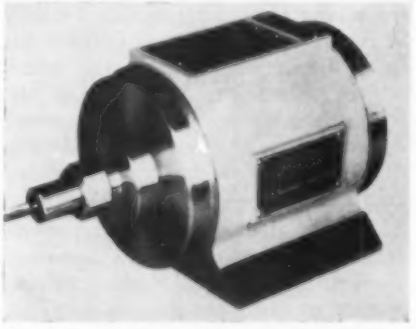
Super-precision, heavy-duty boring spindle.



Tool and cutter grinder spindle clearance angle swiveling head with angular adjustment in a vertical plane.



One hp totally enclosed, 3600 rpm motorized, cartridge type 6" x 18" surface grinder spindle.



Super precision high frequency heavy duty milling and grinding spindle.

60 cycle 6"x18" surface grinder spindle was shown with a section of the cartridge cut away to demonstrate the unique bearing set-up—double row cylindrical roller bearings and separate thrust bearings for no end-wise movement of the shaft. The same type of spindles with high speed vertical and high speed horizontal grinding attachments were also presented.

Featured also was the Pope motorized tool and cutter grinder spindle which provides angular adjustment on both axes and permits the use of cup wheels for practically all clearance angles, resulting in stronger, longer lasting cutting edges.

Show visitors also had an opportunity to inspect the new wheel holder for surface grinders and tool and cutter grinders. This new holder is quickly detachable, self-removing, and it eliminates the need of a wheel puller.

The Pope Spindle display included heavy duty, vee-belt driven precision milling spindles and wheel heads ranging from ½ to 50 hp, and a number of belt driven, cartridge type internal grinding spindles including those for deep holes. •

Use HANDY Postpaid Card. Encircle No. 107

Pastel Colored Wheel Provides Sharper Contrast

A pastel yellow vitrified grinding wheel, said to be a cooler cutting and more efficient tool, has been developed by Electro Refractories & Abrasives Corp., Buffalo, N.Y.

The attractive pastel color wheel has several advantages over conventional ones. It provides sharper contrast, enabling wheel operators to see the work better and assures quick recognition in the stockroom as a replacement item. •

Use HANDY Postpaid Card. Encircle No. 108

Cutting or Grinding ALUMINUM?

Use INTERNATIONAL 131-A

The ONE Coolant that Gives You All of These Advantages:

- **NO METAL DISCOLORATION**
  Does not stain aluminum or its alloys—regardless of concentration used.
- **INCREASES TOOL LIFE**
  Prevents welding of chips to tool.
- **CUTS WHEEL DRESSINGS**
  Retards loading of grinding dust on wheel.
- **DOES NOT REACT WITH ALUMINUM DUST**
  No contamination—sanitary in every way.
- **NO SKIN IRRITATION**
  Operators approve International 131-A.
- **SUPERIOR FINISH**
  Profilometer readings of two micro-inches or less are readily obtained. Fewer rejects.

International 131-A Gives Outstanding Results on Stainless Steel Too!

It will pay you to get the facts about International 131-A. Write for information.

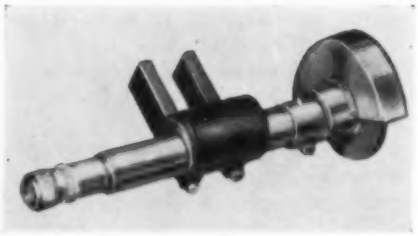
INTERNATIONAL CHEMICAL COMPANY
Specialists in Cleaners and Coolants for Industry
2628 N. Mascher Street • Philadelphia 33, Pa.

Encircle No. 252 on postpaid card

Grinding Spindles for Flexible Shaft Machinery

This new heavy duty Wyco grinding spindle manufactured by Wyzenbeek & Staff, Inc., 223 N. California Ave., Chicago 12, Ill., is claimed to be more convenient than a conventional tool post grinder, since the set-up is made with the spindle only and the flexible shaft motor power is not coupled on until ready to grind.

When used with a Wyco flexible shaft machine, the motor or v-belt drive cannot transmit vibration to the grinder



spindle. When not in use in connection with the tool post grinder, the flexible shaft machine will quickly pay for itself doing general machine shop work.

Construction features of the grinding spindle are: welded steel double shank straddling the tool post; split eccentric sleeve adjusts for lathes from 12 to 18 inch swing; quick change socket snaps on and off; interchangeable adapter fits Wyco No. 1 & 2 and 3 to 5 shafts; removable wheel guard; grinding wheels up to 5" diameter; hardened double clamp screws for height adjustment; and 1½" diameter quill with precision type sealed ball bearings.

No. 351-TP grinding spindle, takes grinding wheels up to 5" dia., ½" hole and 1" wide. It comes with adapter and quick change socket to fit Wyco flexible shafts Nos. 1 and 2.

No. 551-TP grinding spindle is the same as above but to fit flexible shafts Nos. 3, 4 and 5.

No. 251 is specially designed for the Wyco No. 00-UP grinder. It uses mounted grinding wheels in collet spindle or regular grinding wheels with a No. 305 wheel arbor. It comes complete with adapter and quick change socket to fit Wyco flexible shafts Nos. 0 and 01, as well as the 00P-M shaft of the No. 00-UP grinder. •

Use HANDY Postpaid Card. Encircle No. 109

Free Technical Bulletin on Surface Measurement

gives all the meat of ASA Standard B46.1-1955 on surface roughness, waviness and lay, plus helpful supplementary material. Arranged for easy reading and convenient reference. Includes these sections:

- **Basic definitions — with profile records of typical surfaces.**
- **How to designate the characteristics of roughness, waviness and lay, on drawings.**
- **How to measure those characteristics.**
- **Arithmetical and r.m.s. average roughness height.**
- **How the Profilometer® measures average roughness height.**
- **Instrument characteristics for roughness measurement — as specified by the standard, and as provided by the Profilometer.**

It's timely—authoritative—comprehensive. Eight pages, illustrated. *Write for BULLETIN LT18.*

Profilometer is a registered trade-mark.

MMC MICROMETRICAL MANUFACTURING COMPANY

341 S. MAIN ST. ANN ARBOR, MICH.

Encircle No. 253 on postpaid card

Surface Grinder Attachment Affords Damp, Refrigerate Grinding

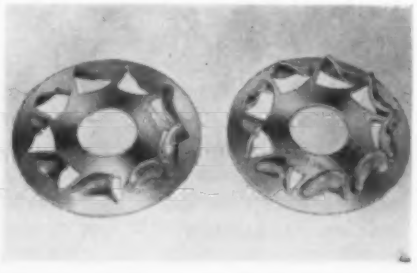
A new attachment for the surface grinder is claimed to give most of the benefits of wet grinding without the mess.

An adjustable sight feed with connected tubing places approximately a drop of coolant a second into a louvred disc fitted against the back of the wheel, which gathers air, compresses it and forces the moisture through the wheel, coming out at the periphery and point of contact in a fine, quickly evaporating cold mist.

Another disc with air foils on the front of the wheel creates a suction through the pores of the wheel, helping further to distribute the moisture.

The compression and expansion developed through the wheel create a refrigeration, helpful in keeping the workpiece cool, preventing warpage. Magic City Machine Tool Co., 2128 S. Walnut St., Muncie, Ind. •

Use HANDY Postpaid Card. Encircle No. 110



New Blast Cleaning Abrasive

A new steel grit blast cleaning abrasive, for producing etched finishes, is announced by Wheelabrator Corporation, 1169 S. Byrkit St., Mishawaka, Ind.

Photo shows size GH-25 Steeletts particles magnified five times.

Known as Steeletts, this grit is of high-carbon electric arc furnace steel, specially heat treated to provide the toughness required for blast cleaning operations. It is in the same hardness range as chilled iron abrasives. Steeletts, however, are free from the brittle carbides which cause rapid breakdown of chilled iron. Steeletts particles do not chip away upon impact. The grit shape endures for hundreds of cycles without the sharp edges that are caused by fracturing. Lack of these cutting edges reduces blast cleaning machine wear and maintenance. Abrasive embedment in the work is reduced.

Steeletts grit is particularly adapted to the following types of work:

(1) Providing a deep etch on metallic surfaces for bonding. Coatings of enamel, paint, glass, rubber, plastics, plating, and metallizing readily cling to the etched surface.

(2) Providing lustre on non-ferrous work by exposing virgin metal and giving it a matte-type surface.

(3) Descaling alloy forgings and heat treated work.

(4) Etching steel mill rolls. High hardness and great impact penetrate, giving a deep, long lasting etch.

They are available in seven sizes, ranging from G-16 down to G-120. All are screened to SAE size specifications. •

Use HANDY Postpaid Card. Encircle No. 111

Bench Type Cylindrical Lapper

A new 6" bench type cylindrical lapping machine designed to provide micro-inch finishing of piece parts to 1 RMS or less at remarkable economy has been developed and is now being manufactured by the Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 41, Ill.

This new machine is compactly made to fit conveniently on top of any work bench. Operation is so simple, far less skill than usual is required of the operator.

A modification of Spitfire's Model 12 cylindrical lapping machine used on many production lines and in many metal working shops, this new smaller unit combines versatility with savings of time, work and cost. Capable of producing exacting tolerances in one-third the time of other cylindrical lappers, according to actual test, this new unit assures quality control for less cost . . providing precision lapping for plug gages, cylindrical pieces, tapered plugs and pins and similar piece parts up to 6" in diameter.

Many advanced operational features are built into the new Spitfire 6 lapping machine. Rings, collets and chucks are not used. It is the only lapping machine

specially designed with vented rollers to eliminate cooling off periods permitting increased output. The precision of the close-grain, cast-iron rollers means maximum accuracy in finishing. Other innovations include self-aligning ball bearing pillow block, olite bearings and 4-speed interchangeable pulley drive. •

Use HANDY Postpaid Card. Encircle No. 112

SANFORD BENCH SURFACE GRINDER
MODEL SG

for Wet or Dry Grinding!*

PRECISION • SPEED • SENSITIVITY

A *low cost*, precision machine for surface grinding dies, instrument parts, gauges and other small parts which would fit in the palm of the hand.

By using Sanford Bench Grinders many manufacturers of precision machinery have drastically cut over-all costs for finishing small intricate parts. This releases large, more expensive machines for heavier duty work.

The Sanford SG is the *only* low cost Bench Surface Grinder that

- **Grinds to less than .0001" tolerances**
- **Operates without vibration**
- **Assures long life because Meehanite castings are used in its construction**

SPECIFICATIONS—4" traverse —8" longitudinal—6" vertical under 4" wheel. Approximate weight 160 lbs.

Complete details are included in illustrated bulletin.
Send for your copy today.

Reconditioning facilities, replacement parts and special attachments are available.
Send for price list.

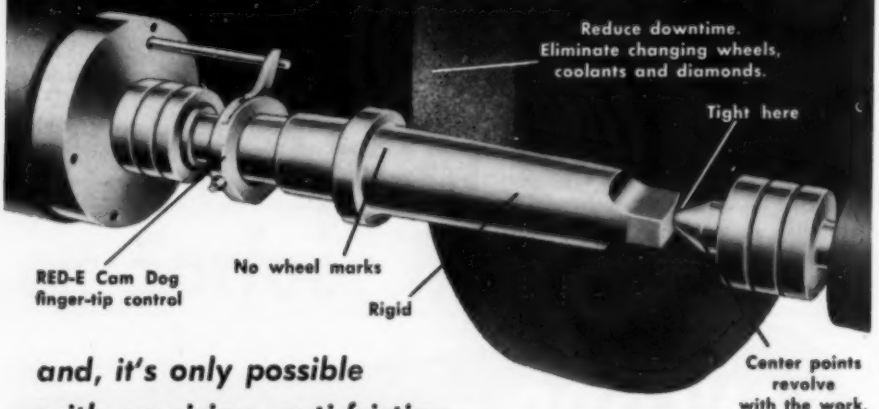
**With optional equipment*

SANFORD MANUFACTURING CORP.
1026G Commerce Ave., Union, N. J.

Encircle No. 254 on postpaid card

Accuracy: to less than 50 millionths —

MAN... THAT'S MICRO-FINISH!



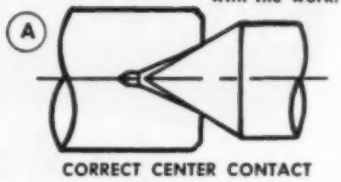
and, it's only possible with precision, anti-friction

RED-E GRINDER CENTERS

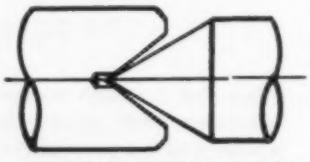
Chatter, wheel marks and out-of-roundness is caused by looseness in the center hole. The center and workpiece must be integral . . . rigid; the point in contact with the largest periphery of the centerhole, as illustrated in (a). Likewise, the bearing assembly must be able to provide great radial and thrust load capacities, with a minimum deflection under continuous operation.

If you're using anything but **RED-E** it's costing you money and you're not getting micro-finish!

Help yourself to super finishes. Read the new RED-E booklet "A New Concept In The Art of Grinding." Ask your Industrial Distributor for a copy today, or write direct.



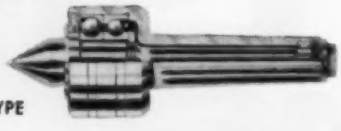
CORRECT CENTER CONTACT



INCORRECT CENTER CONTACT

Two Grinder Center Types

SHANK TYPE



SPINDLE TYPE

Only RED-E GRINDER CENTERS are constructed to meet these requirements because:

1. Bearing assemblies are locked in, Duplex ABEC-7 spec, Precision, Preloaded, Angular Contact New Departure ball bearings.
2. Points are of High Speed Steel, ground 60 degrees, 30 minutes included angle.
3. Lubricated for life.
4. Labyrinth enclosure keeps out all coolants.
5. Guaranteed.

TAPERS AVAILABLE

	Morse	B&S	Jarno	Norton	Landis
SHANK	1 to 6	5 to 15	4 to 20	10 to 16	.8125, 1.335, 1.750
SPINDLE	2 to 7	7 to 18	6 to 20	10 to 24	.8125, 1.335, 1.750

Special heads, tapers, shanks and points made to order.

CENTER *Specialists Since* 1908

RED-E-TOOLS READY TOOL COMPANY

566 Iranistan Ave. • Bridgeport 5, Conn.

Encircle No. 255 on postpaid card

Carbide Super Finisher Eliminates Diamond Wheels in Offhand Grinding

Carbide tools can now be finished directly from rough grinding without the use of diamond wheels, with the new Micro-Carbide finisher, manufactured by Micro-A Engineering Co., of California, which produces super finishes down to 1 micro-inch without incurring costs common in diamond wheel grinding.

Leading manufacturers and machine shops using the Micro-Carbide finisher report increased tool life as much as 400%, thus decreasing machine "downtime" for tool sharpening, set ups, etc. Speeds and feeds are more uniformly maintained and, on certain materials, increased as much as 100%.

Operator need not be a skilled tool grinder. Its operation is amazingly simple and quickly mastered by most anyone in the shop. The diamond charged lapping discs are exceptionally durable and many now being used have been in operation for over two years.

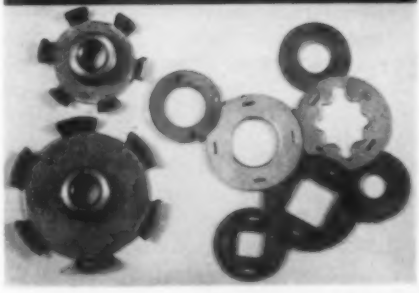
Finisher comes equipped with (1)

two finishing discs, (2) 12¼ x 8″ deep, heavy, ground cast iron tables, (3) large scales and indicator for easy precise table setting adjustable 30° up and down, (4) through-lock on tapered trunnions secures table on both ends without loss of settings, (5) cabinet with locking door for diamond compound storage, (6) heavy cast iron base, (7) flat top guard for convenient working area, (8) mobile lamp, (9) reversing switch (10) totally enclosed motor and reducer equipped with sealed ball bearings, available in single and three phase motors.

Write Boylhart, Lovett & Dean, Inc. 601 S. Rampart Blvd., Los Angeles 57, Cal., for further information. •

Use HANDY Postpaid Card. Encircle No. 113

CARROLL-LOCK Grinding Wheel INSERTS



Complete engineering and manufacturing facilities for producing safe mountings for your grinding wheels.

For special or standard accessories from stamped metal, get a Carroll quotation.

CARROLL PRESSED METAL CO.
138 DEWEY ST., WORCESTER, MASS.

☐ Send information and catalog.
☐ Send quote on enclosed blueprint.

NAME

ADDRESS

OVER 50 YEARS OF PRECISION METAL FABRICATION

Encircle No. 256 on postpaid card

Only Cutter Grinder in the WORLD with all these features

END MILL CENTRA·POINT GRINDER ®

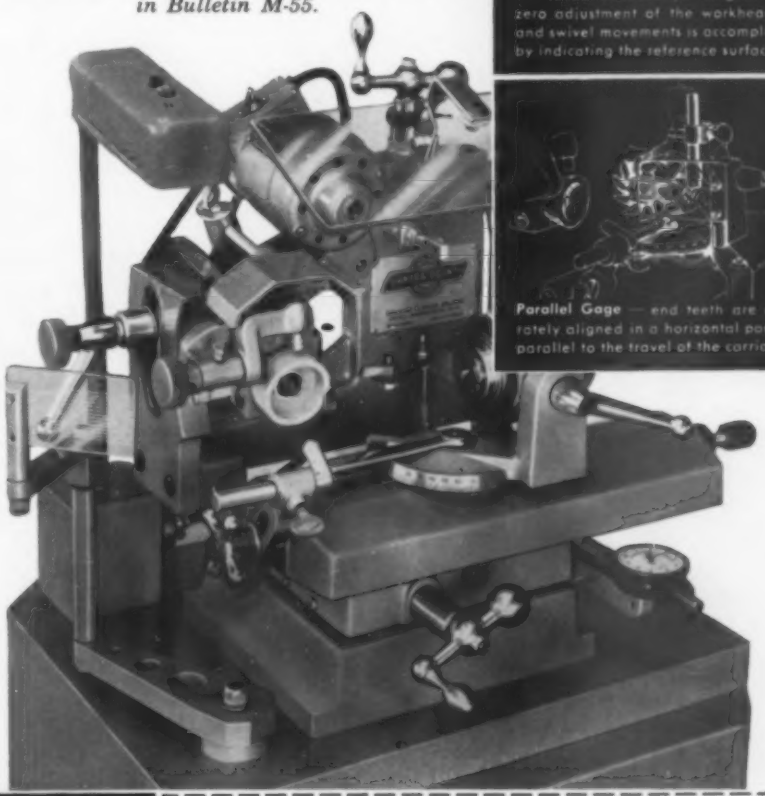
Specifically designed for sharpening the small cutters that are so difficult to grind on large machines, CENTRA-POINT is fully described in Bulletin M-55.

Clearance Angle Scale — clearance angles are read directly from a graduated scale on wheel spindle assembly.

Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel, in correct relationship to self-registering tooth rests.

Reference Surfaces for Alignment — zero adjustment of the workhead tilt and swivel movements is accomplished by indicating the reference surfaces.

Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage.



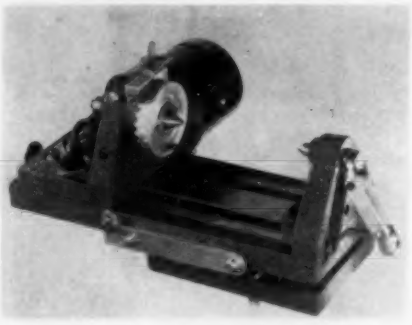
CENTRA-POINT DIVISION
William H. Field Co., Inc., 331 Dorchester Ave., Boston 27, Mass.

Please send a copy of the new CENTRA-POINT Data Sheet.

Name *Title*
(Please Print)
Company
Address
City *Zone* *State*

Encircle No. 276 on postpaid card

Surface Grinder Attachment for Precision Cylindrical and Index Grinding

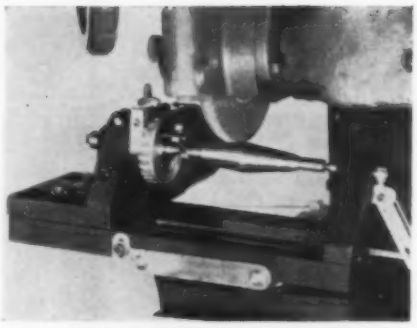


This attachment, called Cylindex, was designed by Cylindex Div. of Binghamton Die & Mach., Inc., 44 Charlotte St., Binghamton, N.Y., to fit all makes of surface grinders. This machine is solidly built for easy handling and rapid set-up.

Within its size limits, it is claimed to do the work of a much more costly cylindrical grinder, at nearly the same production rate. In addition, Cylindex will grind tapers and flats with high accuracy, and because it can be placed on the magnetic chuck, turned to any angle, it can be used to grind milling cutters and other intricate tools.

Dead centers assure sustained concentricity. For chucked work, the spindle turns, without measurable play, on a precision, sealed ball bearing at the front and in a ground and lapped, hardened steel journal bearing at the rear. All moving parts are fully sealed against entrance of grinding swarf, including the switch, with its oil-proof boot.

The unit comes with a heavy duty motor and a worm drive, for vibrationless grinding. Sealed-in oil lubrication in head stock protects worm and bearings. The tail stock release is operated from the front of surface grinder for safety and higher production.



Standard attachments for Cylindex include one precision 4-jaw independent chuck (1/16″ to 2″ capacity), one spindle dead center, one steady rest, and three work driving dogs, 1/16″ to 1″ range. All necessary wrenches are furnished, including four Allen-type wrenches and one chuck wrench. A sturdy wood carrying case is provided, finished in a baked-on gray enamel. •

Use HANDY Postpaid Card. Encircle No. 114

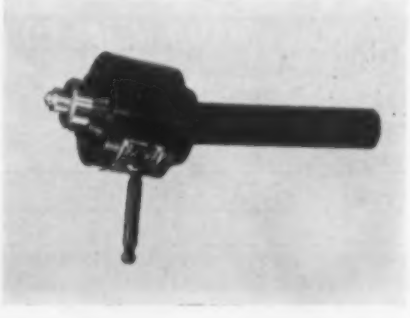
Diamond Turner to Reduce Diamond Tool Costs

Wheel Dressing, Inc., 8720 W. Chicago, Detroit 4, Mich., has announced "Turnit," the new mechanical rotating diamond tool holder designed for manufacturers who want a simple mechanical turner which will give their diamond tools longer life, less down time and a better finished product.

Turnit rotates the diamond tool manually or automatically presenting at predetermined intervals a new sharp face of the diamond to the grinding wheel. The rotation of the diamond tool eliminates excessive diamond heat and pressure, keeps the facets small and sharp, increasing diamond tool life at least 50%.

Turnit is also claimed to give a better wheel finish, eliminates dull glazed wheels, permits closer work tolerance and increases wheel life. The tool holder has infinite adjustment in a range of 0° to 10½° to obtain from 35 to 360 facets. This is accomplished by means of a simple set screw. •

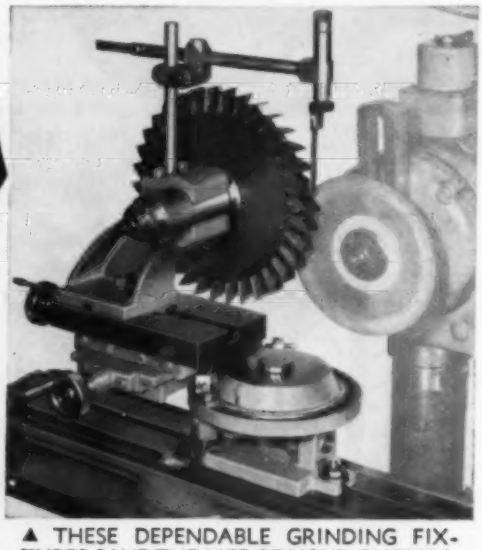
Use HANDY Postpaid Card. Encircle No. 115



THE UNIVERSAL RADIAL CUTTER GRINDING FIXTURE

Does 5 Operations without removing cutter from its ARBOR!

On cutters up to 8" in diameter, the No. 6 fixture, as shown with our No. 6A heavy-duty, right-angle, ballbearing spindle workhead:
Sharpens side teeth on **both** sides.
Sharpens peripheral teeth.
Generates small or large radii on **both** corners of each tooth.
(Other workheads available)

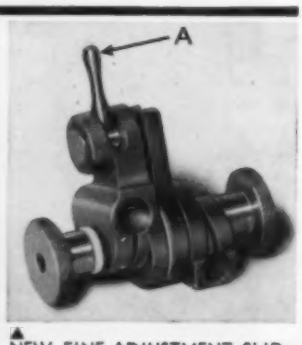


▲ THESE DEPENDABLE GRINDING FIXTURES SAVE THE LIFE OF YOUR CUTTERS. Write for our catalog 603

◀ UNIT 1A
This Universal Cutter Grinding Fixture fits any universal tool or surface grinder.

Radial Grinding Attachment D combines with Unit 1A for sharpening end mills with square, conical, or ball nose shapes. ▼

▲ UNIT 4A
Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.



▲ NEW FINE-ADJUSTMENT SLIDING SWIVEL GIVES SMOOTH, PRECISE INDICATOR SETTING. Smooth, positive positioning of finest dial indicator is readily accomplished by the fine-adjustment Sliding Swivel. Final precise positioning is accurately made by slight movement of convenient lever "A".
WRITE FOR:
SLIDING SWIVEL FOLDER

ROCHELEAU TOOL & DIE CO.
650 North Main St., Leominster 1, Mass.

Encircle No. 258 on postpaid card

Tracer for Measuring Surface Roughness

Micrometrical Manufacturing Co., 345 S. Main St., Ann Arbor, Mich., has announced the Profilometer Type LJ Tracer for measuring surfacing roughness. This new tracer will measure more than 85% of all the varied surfaces produced by industry, and measures all surfaces produced in many plants. It can be operated by Mototrace or by hand and can be used with any Profilometer Amplimeter and Mototrace.

This versatility is made possible by having the tracer point at the end of a projecting beam, and by three interchangeable Skidmounts that support the tracer on the work surface.

The Type FP Skidmount has a small-diameter nose, with a single skid directly back of the tracer point, and is used for mechanical tracing with a Mototrace. It measures on ID's as small as ¼", OD's as small as ⅛", flats and tapers. The single-skid construction permits its use on splines and other narrow surfaces.

The Types FL and FM Skidmounts have two skids, one at each side of the tracer point, and are used for manual operation, with the tracer held by a plastic clip or attached to a Stiffarm or Extension arm. They may also be used for Mototrace operation. The Type FL Skidmount is used on ID's from ½" to flat; and the Type FM Skidmount is used on OD's from ⅜" to flat. Both may be used on gear teeth as small as 10 D.P. •

Use HANDY Postpaid Card. Encircle No. 116

Belt Grinders Feature New Wheels, Improved Belt Alignment

Four improved models of the Delta 2½-in. belt grinder featuring new rubber contact wheels and improved belt alignment adjustment have been introduced by Rockwell Manufacturing Company's Delta Power Tool Div., 446 N. Lexington Ave., Pittsburgh 8, Pa.

The new contact wheels enable the user to obtain a better finish in less

time. They also reduce costs by increasing the life of abrasive belts. The hubs are designed to accommodate standard tires 2½ ins. wide and 6 ins. in diameter so that tires may be easily replaced from most industrial distributors' stocks.

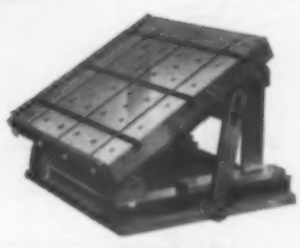
For easier and more accurate belt alignment, the standard back stand idler units in the new models are designed to make possible lateral adjustment of the drum. They also still have the hand knob control for belt tracking adjustment.

The new models are also being shipped to dealers as an assembled unit for the first time, allowing for faster service and easier display. •

Use HANDY Postpaid Card. Encircle No. 117

Robbins ...THE COMPLETE LINE OF ANGULAR TOOLING EQUIPMENT

Save dollars in valuable tool room time on every job! Set-ups that require hours by other methods take minutes the Robbins way. Just four simple steps: (1) Look up required angle in Table of Constants furnished with each tool, (2) Select gage blocks from the Table, (3) Place gage blocks between base of unit and sine bar swivel block, (4) Secure the work . . . and you're ready to go! Complete range of models and sizes brings Robbins precision equipment within the reach of every shop, large or small.

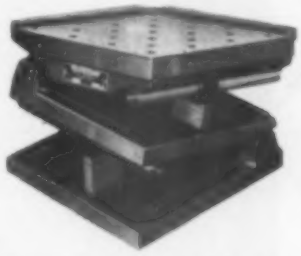


HEAVY DUTY SINE PLATES FOR MILLING AND BORING

Fool proof! Rugged enough to take thrust and chatter of heavy cuts . . . yet built to tool room accuracy for the most exacting inspection operations.

"MAGNA-SINE" MAGNETIC TABLES FOR PRECISION GRINDING

Set up and grind any single or compound angle fast! Work is held securely by magnetic attraction, clamped or released in an instant. Work can't warp or move.



INSPECTION SINE PLATE FOR EVERY INSPECTION OPERATION

Eliminate chance of errors in inspection department and tool room! No more V-blocks, angle plates, or complicated built-up sets of blocks. Simple, fast and sure.

Write or call for complete information now!

OMER E. Robbins COMPANY

24800 PLYMOUTH ROAD DEPT. H DETROIT 39, MICH.

Also producers of special machinery, gages and fixtures

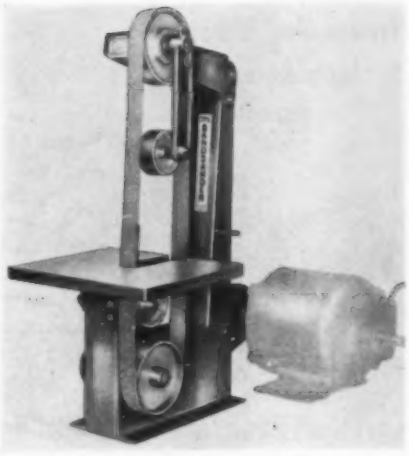
SEE ALL ROBBINS PRODUCTS IN BOOTH 416—ASTE SHOW

Belt Sanding, Deburring, and Grinding Machine

A streamlined and modernized version of the popular sanding, de-burring and grinding machine has been announced by Mead Specialties Co., Dept. B-6, 4114 N. Knox Ave., Chicago 41, Ill. The frame members are now steel stampings instead of rough iron castings, and have a lustrous hammered satin finish in vista green.

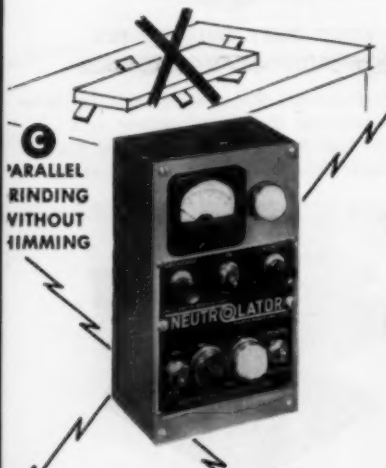
The original features of this unique and time-tested machine have been retained and improved upon—quick change of abrasive belts, tilting table top, automatic self-alignment of pulleys, automatic spring belt tension, and the exclusive ability to pass the belt through cut-out openings to sand inner edges.

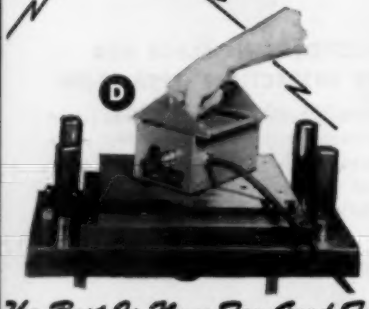
The new model uses either 1" x 42" or 1" x 44" belts for both inside and outside grinding, making it unnecessary to stock both sizes. It is equally good for roughing out coarse cuts or putting final finish on metal, plastic or wood—depending only on selection of the proper grit and the instantaneous change of belts. Some large plants use literally hundreds of these adaptable little machines, spotted around the shop at strategic points to fill in "waiting time" on other machines; and there is no setup time. •



Use HANDY Postpaid Card. Encircle No. 118

electrical controls for Full Magnetic Chuck performance





A ELECTRO-MAGNETIC CHUCK CONTROL
Releases and demagnetizes work pieces simultaneously. No time lost. No damage to work or chuck face. Protects chuck from voltage surges. Speeds production. Chuck capacities: 50 to 15,000 Watts . . . 60 to 20,000 square inch chuck area.

B ELECTRO-MATIC RECTIFIER
Power conversion Unit, proved for dependable use with Magnetic chucks and other direct current equipment, from 50 Watts to 40 Kilowatts.

C NEUTROLATOR HOLDING POWER REGULATOR AND CHUCK CONTROL
Provides regulation of holding power which permits grinding without shimming, to closer parallelism than ever before possible. In production grinding where holding power must be the same with each work piece, Neutrolator reproduces the same tension on successive pieces without readjustment. Where various tensions are required, a simple dial or push-button control provides regulation of holding power.

D ELECTRO-MATIC A.C. DEMAGNETIZER
Demagnetizes dies, punches, cutters, tools that have been magnetized from any source. Works by simple contact. Operates on standard A.C. voltage. Will not overheat through constant use. A size for every purpose.

The Best Is None Too Good For Your Cutting Tools And Dies

ELECTRO-MATIC PRODUCTS CO.
2237 N. Knox Ave. Chicago 3, Ill., U.S.A.
Telephone: BEImont 5-4010

Encircle No. 260 on postpaid card

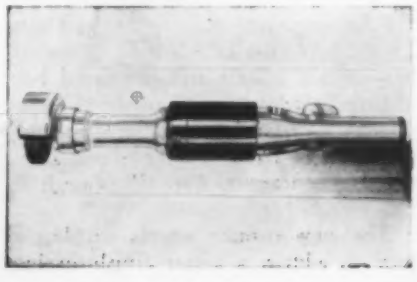
Redesigned Portable Air Tool Line

X-4 is the model designation for a complete new line of portable, air-powered abrasive tools now being produced by Buckeye Tools Corp., P.O. Box 966, Dayton, O. The new line is being shown for the first time at the ASTE Exposition in Chicago, and includes completely redesigned Buckeye horizontal grinders and buffers, vertical grinders and sanders and right angle sanders.

Outstanding feature of the redesigning work on these X-4 tools is an entirely new, highly sensitive governor which enables the tools to develop greater power and to maintain higher speeds under load. It is this combination which makes it possible for Buckeye X-4 abrasive tools to remove more metal in less time on any abrasive job. Despite the increased power and speed, X-4 models weigh no more and are no larger than previous models.

Present users of Buckeye D, E and F series abrasive tools can secure improved X-4 performance by making certain modifications in existing tools. Information on the new Buckeye X-4 abrasive tools, as well as the complete line of Buckeye air and high-frequency electric tools and accessories for industry, is available in Catalog A-10. •

Use HANDY Postpaid Card. Encircle No. 119



Air Grinder Features One-Piece Housing and 50% More Power

A new and more powerful air grinder designed especially for use in foundries and other metal working operations has been perfected and is now in production at Thor Power Tool Co., Aurora, Ill.

Completely re-designed, from its one-piece housing to a newly developed air motor which rates the machine at 50% higher power than similar tools in its seven-pound weight class, the new Thor grinder has been designated the Model 5V. It replaces the company's Model 250-D air grinder.

It is being made available in speeds of 4500, 6000, and 8000 rpm and features an adjustable, positive-speed governor which increases air economy and assures complete safety under all operating conditions. A built-in exhaust muffler effectively reduces noise levels.

An important design feature is that grip handles on the 5V are spaced 110° apart rather than the conventional 90°. Thor engineers believe that this change will heighten operator convenience and hence increase efficiency. Other features include automatic mist oiling from a large-capacity reservoir, double-row, preloaded spindle bearings and hardened steel center plates.

Extra equipment and accessories being made available with the new 5V grinder convert the tool from a vertical cup grinder to a sander, wire brush machine or depressed center, disc-wheel cut off grinder. Available wheel guards will include a compact rotating unit, an open end cup wheel guard, and a unit for cut off wheels. •

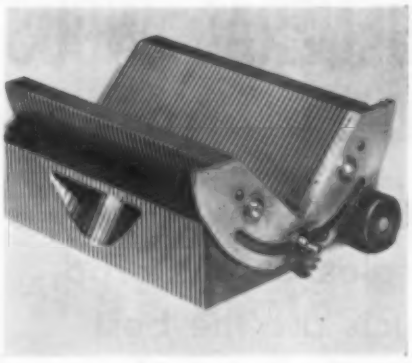
Use HANDY Postpaid Card. Encircle No. 120

Precision Magnetic Adjustable V-Block

Designed to aid toolmakers and production men in setting up grinding jobs, the Anton magnetic adjustable V-block is outstanding in its field in that it is both magnetic and adjustable. It is made of alternating laminations of non-magnetic brass strip and material with high permeability and low residual magnetism. All laminations match perfectly and are guaranteed not to shift since they are held without pins or rivets.

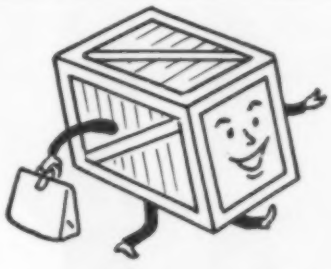
Fast replacing the magnetic angle chuck, this new V-block can be more quickly set because of the elimination of sine bar, gage block and indicators. Further, it can be installed and removed without any chuck adjustment; and may be used for flat or larger area work merely by using an inverted-V laminated insert.

The V-groove is precision ground to a 90° angle, parallel to the base and sides of the bottom block to ±.00005" over the entire length. The vernier is graduated to 5 minutes and vernier settings are accurate to 15 seconds.



It can also be used on drill presses and other machines equipped with magnetic chucks. It is especially useful in toolroom and layout work, and for high-quality, close tolerance production work. Anton Machine Works, 1226 Flushing Ave., Brooklyn 37, N.Y. •

Use HANDY Postpaid Card. Encircle No. 121



IMAGINE OUR SURPRISE!

. . . we shipped

A SALESMAN

to MARION MALLEABLE!

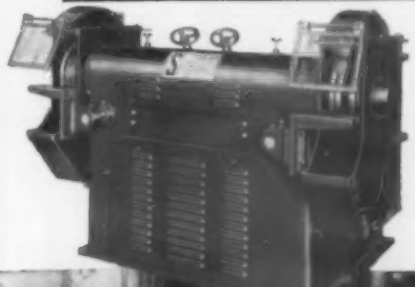
Yes sir, that FIRST Standard 35C Infinitely Variable Speed Grinder we shipped to Marion Malleable in Marion, Indiana SOLD 4 MORE IN LESS THAN A YEAR! When we asked grinding room Super Harold Williams about it, his answer was short — and mighty sweet: "WITH YOUR GRINDERS, WHEEL COST IS DOWN AND PRODUCTION'S UP!"

Here's the way it looks all dolled up in chart form:

Make of Grinder	Wheel Cost Per Ton	Avg. Hourly Production-Tons
Brand X	$3.20	.44
Standard No. 35C	$1.75	.49

IT'S THE STANDARD STORY WHEREVER YOU GO. Like we said "mighty sweet" ...FOR RAISING YOUR PROFIT CURVE.

SUPER SALESMAN!
The Standard No. 35C
Infinitely Variable Speed
SNAGGING GRINDER



Battery of Standard Grinders, Marion Malleable

Booth 1838 • Castings Congress • Atlantic City • May 3-9

the STANDARD electrical tool co. Since 1912

FOUNDRY GRINDER DIVISION

2478 RIVER ROAD • CINCINNATI 4, • OHIO

Encircle No. 261 on postpaid card

GENERAL INDUSTRIAL
Diamond Products

Constantly increased sales of our products are the best testimony of their quality.

Tool, Wheels, Powder, Hones, Loose Diamonds

Visit us at Booth 810, A.S.T.E. Exposition

March 19-23rd, 1956.

'Honesty, Integrity and Service are our Motto"

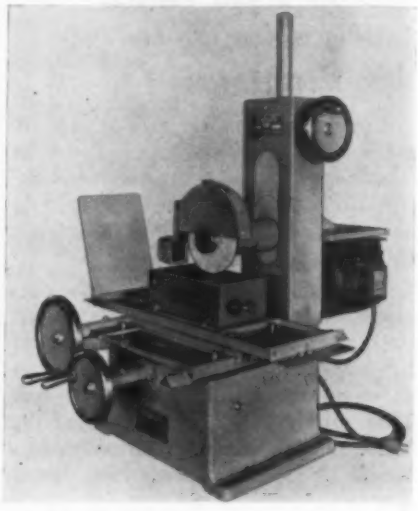
GENERAL INDUSTRIAL DIAMOND CO., INC.

611-21 Broadway, New York 12, N.Y.

ALgonquin 4-8025 ALgonquin 4-8071

Encircle No. 262 on postpaid card

Dual Purpose Surface Grinder



The Butterfly precision surface grinder, SG-48, a dual-purpose hand feed bench type surface grinder, claims rigidity and power for heavy cuts combined with high sensitivity for precision finishing.

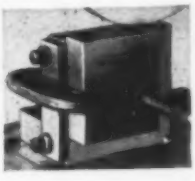
Both ends of the spindle are mounted in duplex-mounted angular contact ball bearings. Spindle is powered by 1/3 hp, 3450 rpm motor. Harvey Mfg. Corp., subsidiary of Germanow-Simon Machine Co., Inc., 408 St. Paul St., Rochester 3, N.Y. •

Use HANDY Postpaid Card. Encircle No. 130

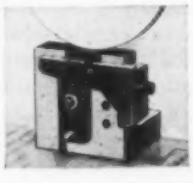
LASSY MASTER V-BLOCK

ANGLE PLATES

This Master V-Block Angle Plate is an improved new design. Saves hours of setup time. Assures precise work accuracy. Requires less skill.



Side Gage automatically squares work precisely and without removing angle plate from chuck. Repetitive accuracy maintained.



Adjustable parallel holds the smallest work for position and clamping with ease and accuracy.

LASSY MASTER Angle Plate provides a master setup for regrinding of worn or inaccurate Angle Plates.

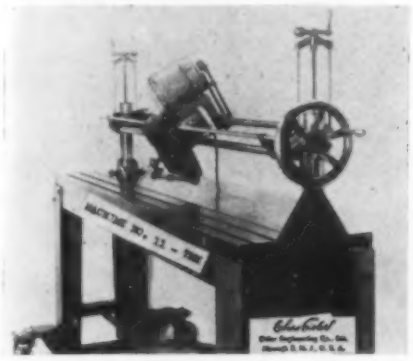
WRITE FOR DESCRIPTIVE LITERATURE

LASSY TOOL COMPANY

PLAINVILLE, CONNECTICUT, U.S.A.

Encircle No. 263 on postpaid card

Wet Type Abrasive Cutter



No. 11-TMM wet type abrasive cutter for cutting tungsten, molybdenum, etc., particularly in thin sheets, is claimed to make accurate longitudinal cuts on bars, tubes and sheets. Work head carries cutting wheel 12" diam. x 1/16" thick, operating at 1720 rpm from motor of ¼ hp. Work head slides on two bars of 1¼" dia. and cranked over a distance of 42"; the travel is manual by means of hand wheel and feed screw which engages a half nut on work head.

For quick return, the half nut is disengaged from the feed screw and work head moved back by means of a handle. The work head can be tilted and locked at any angle from vertical to horizontal. Eisler Engineering Co., Inc., Newark 3, N.J. •

Use HANDY Postpaid Card. Encircle No. 123

CLIPPER

PRECISION DIAMOND TOOLS

Industrial Diamonds
Thread Grinders
Turning Tools
Engraving Tools
Dressing Tools
Diamond Powder

Manufacturers of
DIAMOND TOOLS
and
WHEELS

BRANCH OFFICES

CINCINNATI, STEVE URBAN, 122 Springfield Pike
CLEVELAND, BILL WIESE, 8905 Lake Ave.
DETROIT, FLOYD BEARSS, 1433 Northwood Blvd., Royal Oak, Mich.
INDIANAPOLIS, IVAN STRANGE, 33 Tyler Ave., Greenfield, Ind.
NEW HAVEN, LLOYD J. SWEET, P.O. Box 74, Woodmont, Conn.
PHILADELPHIA, H. J. MILLER, Valley Brook Rd. and Glen Mawr Dr., Ambler, Pa.
ROCHESTER, N.Y., DON GINEGAW, 10 Oak Manor Lane, Pittsford, N.Y.
SYRACUSE, N.Y., BARNES & JORDAN, INC., 409 E. Jefferson St.

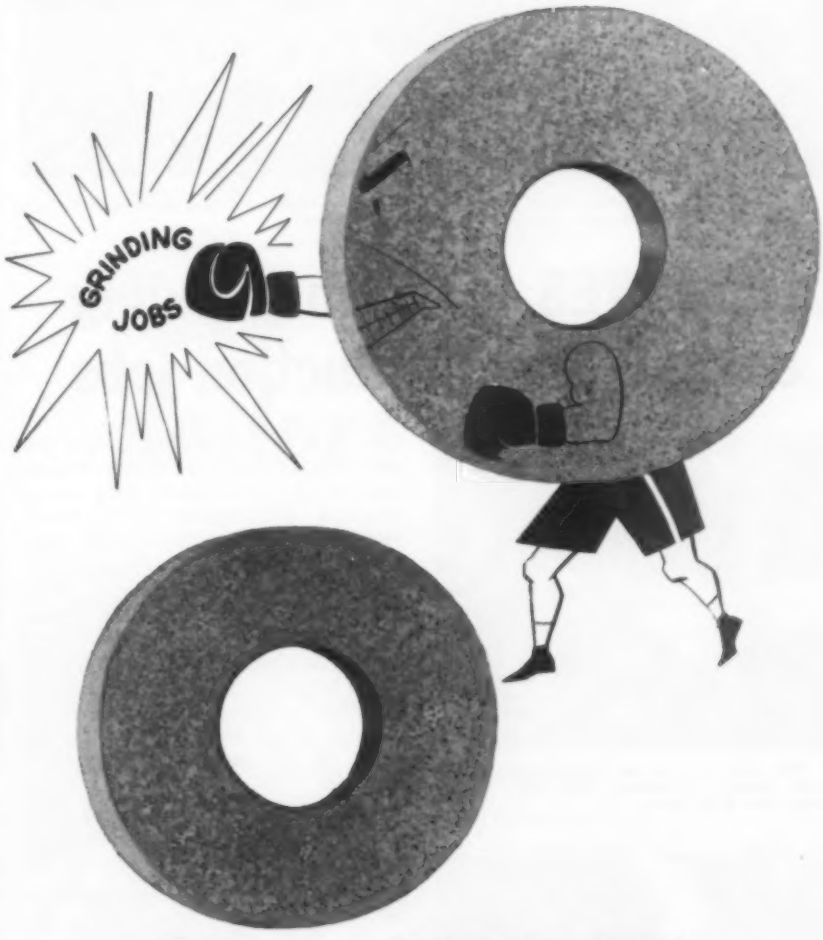
Representatives in Principal Cities

CLIPPER DIAMOND TOOL CO., INC.
215 WEST 46 STREET, NEW YORK 14

Encircle No. 264 on postpaid card

We don't care how

TOUGH they come!



DAYTON SAFETY GRINDING WHEELS

We have been solving tough grinding jobs for industry for over 50 years!
Dayton Safety Grinding Wheels have never failed to meet any test.
What is your toughest grinding problem?
We'll bet we can solve it.
Write for catalogue or the name of your nearest distributor.

SIMONDS WORDEN WHITE COMPANY

1101 Negley Place • Dayton 7, Ohio

Encircle No. 265 on postpaid card

Dumore Hand Grinders precise spindle alignment makes them ideal for close tolerance tool and die production finishing.

DUMORES keep on grinding on toughest production jobs

Built for rugged duty as well as precision, Dumores handle deburring and other tough grinding jobs with ease.

A Dumore Flexible Shaft puts the power in your hand for that extra control on close tolerance work with carbide or mounted wheels and points.

There are two good reasons why you can always depend on Dumore Hand Grinders for continuous duty on the toughest production bench work. First, they have perfect spindle alignment and rigidity. This means longer wheel life, less wheel changes, fewer interruptions. Secondly, this perfect alignment is assured for the life of the grinder by no less than *three* precision bearings housed in steel insert. In short, a Dumore is always ready, whether it's for the finest tool and die work or the most stubborn deburring job.

You'll find too that Dumore has the world's most complete line of Hand Grinders from 1/20 to 1/4 hp and speeds up to 35,000 rpm. A grinder for every job!

Flexible Shaft Tools

These light, easy-to-use tools will cut the cost of your small parts finishing. A complete line of tools with a power range from 1/20 to 1/4 hp.

WRITE FOR CATALOG 55
for detailed information on Dumore Hand Grinders and Flexible Shaft Tools.

DUMORE
PRECISION TOOLS

AUTOMATIC DRILL UNITS
TOOL POST and HAND GRINDERS

1326 Seventeenth Street **Racine, Wisconsin**

Encircle No. 266 on postpaid card

Polishing-Buffing Machine

On the Model 50-99 polishing and buffing machine, the head is powered by a 3, 5 or 7½ hp, 1750 rpm motor or a 10 hp, 3500 rpm motor. Weight of 1400 lbs. is claimed to assure vibrationless operation.

Head has a maximum float action of 4", allowing it to follow the surface or irregular parts. Flat surfaces can be finished without using the floating action. Power wheel feed is available, and an ammeter is standard equipment. Hammond Machinery Builders, 1614 Douglas Ave., Kalamazoo, Michigan. •

Use HANDY Postpaid Card. Encircle No. 124

WALLS TU-WAY BELT SANDER

Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY

VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

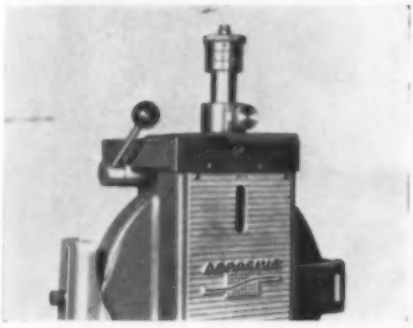
complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request
A few desirable distributor territories still available.

WALLS SALES CORPORATION
333 Nassau Avenue Brooklyn 22, N. Y

Encircle No. 267 on postpaid card

Optional Wheel Dresser for Hydrabrasive Surface Grinders



Abrasive Machine Tool Co., East Providence, R.I., has designed and now offers as optional equipment on their line of hydrabrasive precision surface grinders a built-in, hand-operated wheeldresser. Engineered to rigidly fit into the grinder head, the Abrasive wheeldresser features a micrometer adjustment that accurately measures and controls the amount the wheel is dressed.

This new device has already achieved considerable popularity because of its convenience, speed and economy. With it, an operator can quickly dress his wheel without having to disturb his work or machine set-up. •

Use HANDY Postpaid Card. Encircle No. 125

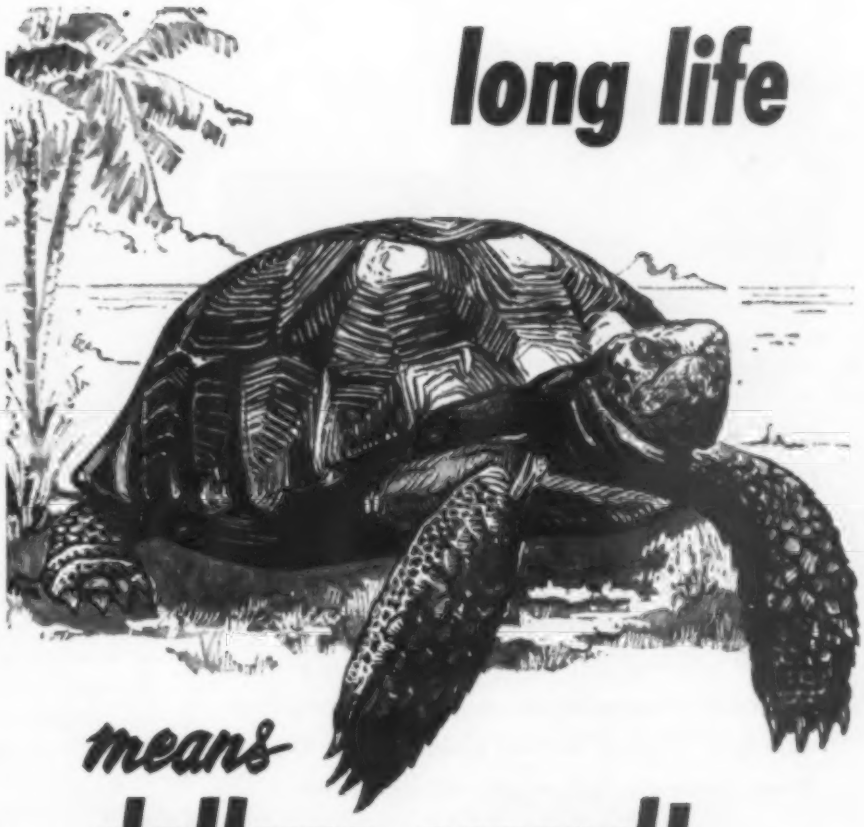
BETTER CUT WITH BEAVER CUT CARBIDE

Cushion Ground and Micro-Lapped Rotary Files, Grinding Burrs, and Center Lapping Tools outlast regular ground carbide tools by 30% yet cost no more.

You may make a greater saving by sending us your dull tools for sharpening by our manufacturing method.

Beaver Cut Rotary File Company
401 E. Slauson Ave.
Los Angeles 11, Calif.

Encircle No. 268 on postpaid card



long life

means

dollars saved!

Whether a 200 year old tortoise would admit this statement is debatable, but with Diamond Wheels it is an indisputable *fact.*

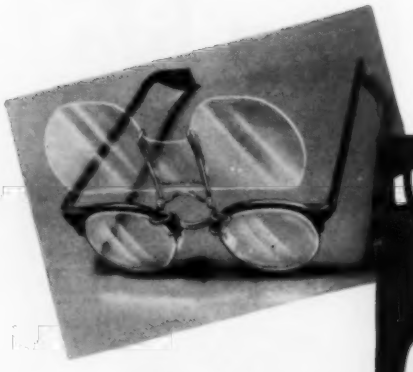
Even then, long wear depends upon many factors; Speed, correct use of coolant and of prime importance, the wheel must be just right for your job . . . in diamond grit size, bond, and in every other detail.

We at **J. K. Smit,** know after many years experience how to satisfy every grinding and cutting need.

Send for your copy of our new Diamond Wheel Catalog No. 54.

J. K. SMIT & SONS, INC.
HOME OFFICE AND PLANT
MURRAY HILL NEW JERSEY

Encircle No. 269 on postpaid card



"KIM CLIP"

THE HANDY WAY TO GLARE PROOF PROTECTION

KIM-CLIP is a simply designed spring clip which holds melter's spectacles or plastic protective shields for welding and grinding operations. KIM-CLIP fits all types and makes of spectacles and can be attached in seconds. Adjustable to three definite positions: Up, OUT or Down. Extremely light weight and inexpensive too.

Kimball SAFETY PRODUCTS COMPANY
9310 Wade Park Avenue • Cleveland 6, Ohio
Encircle No. 270 on postpaid card

NOW! DRESS CARBIDE TOOLS WITHOUT DOWNTIME!

STARLITE
DIAMOND **HAND** FILES

Dress carbide tools and dies without disturbing the set up. Ideal for finishing carbide dies after grinding. Magnicon Metal Bond anchors diamonds to files' cutting surfaces . . . permits higher diamond concentration. Also Mounted Diamond Points, Wheels, Core Drills, Resinoid Bond Diamond Wheels, and Carbide Rotary Cutting Tools.

write for illustrated catalogue
STARLITE INDUSTRIES, INC.
PHILADELPHIA 39, PA.

SEE STARLITE at Chicago ASTE... BOOTH 300

Encircle No. 271 on postpaid card

AT AN ANGLE— IT FILES

USED STRAIGHT — IT FINISHES

the Reciprofiler® IT'S THE NEW "3-WAY" TOOL by—

- Rotates and Reciprocates
- Non-Scratching movement
- 1 to 15,000 R.P.M.—stroke 0 to 3/8"
- Files, hones, saws, laps, polishes, chafes, grinds, mills, engraves, etc.

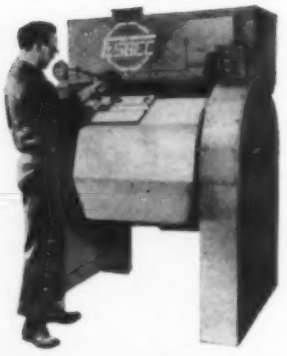
*TRADE NAME—Pats. Pend.

Nord Corporation
14 SPRUCE STREET
NUTLEY, NEW JERSEY

Encircle No. 272 on postpaid card

---

rugged enough for ball burnishing ESBEC series HD



ABRASIVE TUMBLING BARRELS

never need babying, even on the toughest jobs. You can count on uninterrupted production, long life and low upkeep. They're truly heavy-duty, with extra-rigid welded-steel drums, oversize self-aligning bearings, plus power to spare. They give higher production rates with their low loading heights, large unobstructed door openings, quick-locking safety doors, and safe accessible controls.

All ESBEC barrel finishing equipment offers practical, profit-producing features based on first-hand experience in our own, and other finishing plants. **Write for catalog today!**

EQUIPMENT SUPPLIES ABRASIVES

ESBEC BARREL FINISHING CORP.
20 BEECH ST., BYRAM, CONN.

BOOTH 768 ASTE SHOW

Encircle No. 273 on postpaid card

ECONAWAY ABRASIVE BELT SPLICER

Reduce expenses by splicing your own abrasive belts and sleeves with the Econaway Abrasive Belt Splicer. Either the Floor Model or the Bench Model will splice belts of any length and from the narrowest up to fourteen inches wide, wider made to order. Any abrasive either paper or cloth back may be spliced. Splices are set under high pressure with the thermostatically controlled Electric Press.
Both Models are precision built, to close tolerance, of strong material, modernly finished.

"You Save Every Way with ECONAWAY"

Write for Free Literature
Manufactured and Distributed by

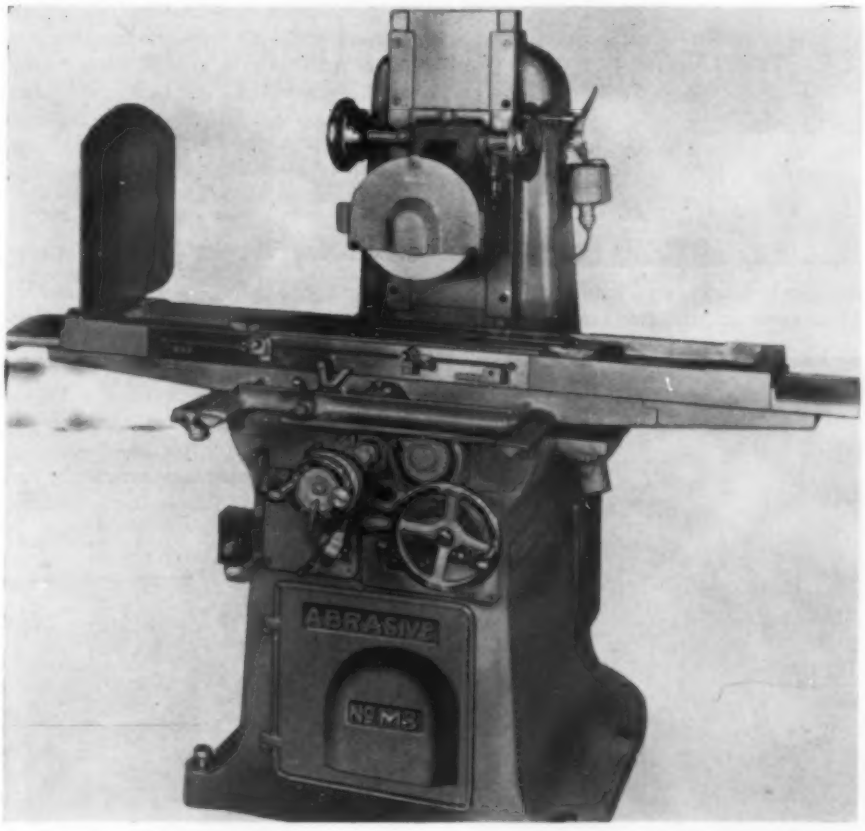
Patented U.S. and Canada

ECONAWAY MANUFACTURING CO.
Bellevue, Michigan

Encircle No. 274 on postpaid card

Please mention GRINDING and FINISHING when writing advertisers, or use the Handy Reader's Service Card. On the card merely encircle the item in which you're interested. Information will be forwarded promptly.

Surface Grinder with Direct Spindle Drive



Dealers of the Abrasive Machine Tool Co., of East Providence, R.I., are demonstrating Abrasive's No. M3 precision surface grinder with built-in direct two-horsepower motorized spindle. The result of customer demand, the M3 incorporates many of the same design features engineered into the entire Abrasive line.

Direct spindle drive (completely removable) is the chief difference between the No. M3 precision grinder and the Abrasive No. 3B. It is otherwise similar in construction, having the same easily-serviced one-piece construction and rigid, one-piece bed with heavy ribs and reinforced openings. Like the No. 3B it has a deep, box-like saddle, a well ribbed table, and 24″ x 8″ x 12″ work capacity. It has fully automatic feeds and built-in shock absorbers. The M3 is available with hardened and ground tool steel ways on bed, saddle and table; hardened and thread ground elevating and cross feed screws, and automatic pressure lubricating system.

With the direct, two-horsepower motorized spindle, it is possible to grind with precision accuracy at table travel speeds of from 20 to 60 feet per minute. ■

Use HANDY Postpaid Card. Encircle No. 126

"Don't you talk back to me!"

We Buy Abrasive Scrap

Write us if you have scrap grinding wheel stubs, obsolete wheels, or any other form of Silicon Carbide or Aluminum Oxide abrasive scrap for disposal.

Needed information includes (1) type of abrasive, (2) type of bond, (3) grit sizes, (4) approximate rate of accumulation, and (5) location.

ABRASIVE PRODUCTS COMPANY

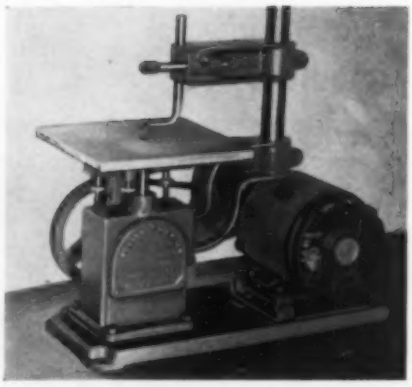
Lansdowne, Pa.

Encircle No. 275 on postpaid card

Die Filer Offers Many New Features

A new Keller die filer for machine shops, tool and die departments, repair and maintenance shops is being produced by Sales Service Machine Tool Co., 2363 University Ave., Minneapolis 14, Minn.

Features include: A self-compensating chuck with wide capacity. Holds ⅛" dia. up to ½" x ⅜" files. File roller support has full 6 inch adjustment for maximum accuracy when using long files. Large work table area of 8½" x 8½" with plenty of room for clamping guide blocks, etc. Table tilts up to 15 degrees in any direction. The four knurled thumbscrews quickly lock table to desired angle. Two speeds of 350 and 450 strokes-per-minute. Stroke length of 1½ inches. The scotch yoke is splash lubricated, and the main shaft is equipped with Oilite Bearings. Complete with ¼ H.P., 1800 rpm motor.



Deluxe model has both file roller support and overarm for filing, sawing and lapping. Standard model, as illustrated, is equipped with file roller support or available with overarm. •

Use HANDY Postpaid Card. Encircle No. 127

Vibratory Lapper and Polisher

A new lapping-polishing machine provides a mechanical method for lapping and polishing metallurgical samples, metallic sealing ring faces, and other metal parts requiring a highly polished surface.

Samples for electron microscope of brush analyzer examination can be finished in quantity in one-third the time necessary to produce one sample by hand, the manufacturer claims.

Vibratory bowl can be lined with whatever polishing cloth is desired for a specified finish. Finger-tip control of vibration regulates polishing speed. It is available in models with bowl sizes from 5" to 24" in diameter. Syntron Co., 300 Lexington Ave., Homer City, Pa. •

Use HANDY Postpaid Card. Encircle No. 128

Concentrated Cutting Coolant for Mist Coolant Systems

K-1000 is a special machining coolant developed for use in the Mistic Mist coolant systems made by Aetna Mfg. Co.

It forms a clear, stable water white suspension in water, eliminating the possibility of clogging.

It has good lubricity and load carrying capacity for tough operations but will not load a wheel when used for grinding. Non-irritating and non-toxic, it contains no mineral oil or other ingredients which can contribute to Lobar toxicity when inhaled.

It is recommended for use on all types of machining and grinding operations on all materials. By increasing the concentration, very severe work can be done. For tapping stainless steel, use one part K-1000 to two or three parts water. Keil Chemical Co., 315 N. Leavitt St., Chicago 12, Ill. •

Use HANDY Postpaid Card. Encircle No. 129

ROTO FINISH

it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

WRITE FOR FACT-PACKED ROTO-FINISH CATALOG NOW

Roto-Finish COMPANY

3730 Milham Road, Kalamazoo, Michigan

P. O. Box 988

Phone 3-5578

Originators of the Roto-Finish Process

Encircle No. 286 on postpaid card

News of the Industry

Walter Schroeder Wins Frederick A. Geier Award

Presentation of the annual Frederick A. Geier Award for engineering achievement was made by Frederick V. Geier, president of The Cincinnati Milling Machine Co., to Walter Schroeder of their engineering department.

The citation reads, in part: "The introduction of our new line of HyPowermatic Milling Machines first shown at our Seventieth Anniversary, and later exhibited at the 1955 Machine Tool Show in Chicago, introduced to our customers the latest development in table feed systems the—Hydramech Feed Drive.

"This system, making use of the ingenious combination of mechanical and hydraulic elements, provides an efficient feed drive for both conventional or down milling cuts, short or long table travel, standard or tracer control cycles, milling cuts from five to one hundred horsepower—and still retaining or exceeding all the flexibility of control common to hydraulic feed milling machines."

Cincinnati also manufactures a complete line of centertype grinding machines, centerless grinders, centerless lapping machines, and micro-centric grinders.

Walter Schroeder, at left, accepts award from Frederick V. Geier, president of Cincinnati Milling.

Grant S. Diamond

William H. Baudouine

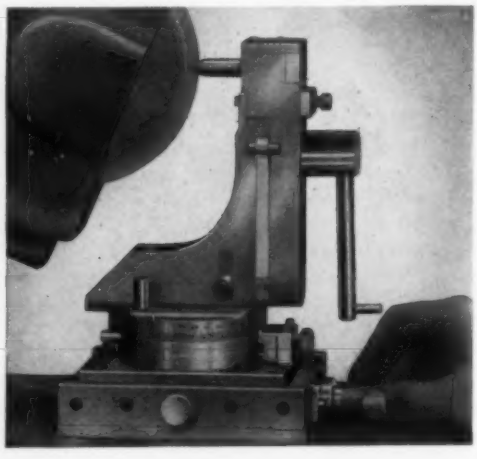
Charles R. Crowder

Tough Grinding Wheel Forms Dressed Easy as A, B, C

eliminate elaborate set-ups and operations

.0001" ACCURACY

Fluidmotion
WHEEL DRESSERS
dress two angles tangent to a radius in one continuous motion



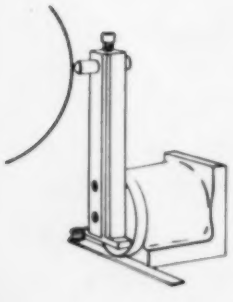
With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Adaptable to all type cylindrical and surface grinders.

A. Obtain micrometer reading; add required convex radius or subtract required concave radius.

B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.

C. Tighten jib. Set stops for two angles. Ready for action.



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave. Prices start at

$45.00

WRITE FOR INFORMATION ON THE NEW J & S PURCHASE PLAN

See your industrial distributor or write for free literature.

J&S TOOL CO. INC. — CLAMPCUT

J & S TOOL CO., INC.
871 DORSA AVE.
LIVINGSTON, NEW JERSEY

Encircle No. 277 on postpaid card

Grant S. Diamond Heads Grinding Wheel Institute

Grant S. Diamond, president of Electro Refractories & Abrasives Corp., of Buffalo, N.Y., has been elected president for 1956 of the Grinding Wheel Institute, which has headquarters in Cleveland. Diamond succeeds Clarence E. Etheridge, of the Macklin Co., of Jackson, Mich.

The Institute represents most of the major manufacturers in the abrasives industry. Diamond has been vice-president and previously headed the Institute's public relations committee.

The abrasives division of Elgin National Watch Company has appointed **William H. Baudouine** new division sales manager.

He was named to the post by C. R. Myer, general manager of the division, to spark the company's carbide tool program currently being expanded.

Baudouine will also direct national sales of Elgin's diamond abrasives and Elgiloy, non-corrosive spring material.

He joined Elgin in 1953 as sales engineer and had been assigned to the Northern Illinois territory including Chicago.

At a meeting of the Board of Directors on December 15, the following were named officers of the Van Norman Machine Company of Springfield, Mass. **Charles R. Crowder,** president; **Roger S. Pyne,** vice-president; **T. W. Baush**, vice-president; **R. W. Porter,** treasurer-secretary; **Samuel McCullough,** ass't. treasurer.

Announcement has been made of the appointment of **Tom Edwards,** traffic manager of Electro Refractories & Abrasives Corp., to the traffic committee of the Grinding Wheel Institute of Cleveland.

Robert Cushman

Harry G. Brustlin

Donald F. Jones

Norton Company has raised three men to managerial sales posts effective January 1, 1956.

Robert Cushman, formerly West Coast district manager, has been named assistant to the sales manager, Grinding Wheels, and will return to Norton's main office at Worcester, Mass. **Harry G. Brustlin,** formerly an abrasive engineer in the Los Angeles area, succeeds Cushman as West Coast district manager. **Donald F. Jones,** formerly an abrasive engineer in the Syracuse, N.Y., area, has been appointed Pittsburgh district manager. He succeeds Charles B. Price who retired after 39 years with Norton Company.

Charles B. Price, Pittsburgh district manager for Norton Company received congratulations from his twin brothers, Don and Ron, for long service on the eve of his retirement which became effective December 31. Don is sales manager, Grinding Wheels; Ron, New England district manager.

In Worcester for a week-long sales conference, Norton district managers from all over the United States and Canada paid tribute to Mr. Charles Price's 39 years with Norton Company. Between them the three brothers represent 102 years of selling Norton products.

Oliver Abrasive & Tool Co., Inc., Buffalo, N.Y., has been appointed exclusive sales representative in central and western New York state by Permattach Diamond Tool Co., Inc., Milford, New Hampshire. Permattach has been instrumental in the development of a new method for permanently bonding industrial diamonds to small tools.

ADAMAS CARBIDE CORP.
KENILWORTH, N. J.:
"Has worked for over two years—2 to 3 shifts daily on Tungsten Carbide—one of the severest tests. Has stood up well. Would not hesitate to purchase another."
INSULATING FABRICATORS
E. RUTHERFORD, N. J.:
"Well satisfied with its accuracy, production capacity, low initial cost, low maintenance and ease of handling."
PYROFERRIC COMPANY
NEW YORK CITY:
"Very successful in grinding large quantities of powdered cores.
"Speedy, accurate—required little maintenance."

HERE'S WHAT USERS SAY ABOUT

THE *New* LOW COST **Royal Master CENTERLESS GRINDER**

Royal Master handles work up to 1" diameter—and many pieces up to 1½". Tolerances as low as .0002 consistently held. 6-8 micro inch finishes easily obtained. Requires only 24" x 58" of space.

The experience of these firms and others using the Royal Master Centerless Grinder proves its efficiency. We will gladly demonstrate it grinding your product.

But best of all, the Royal Master is priced within the means of even the smallest machine shop. It can be working in your shop or department at up to 50% of what other centerless grinders will cost you.

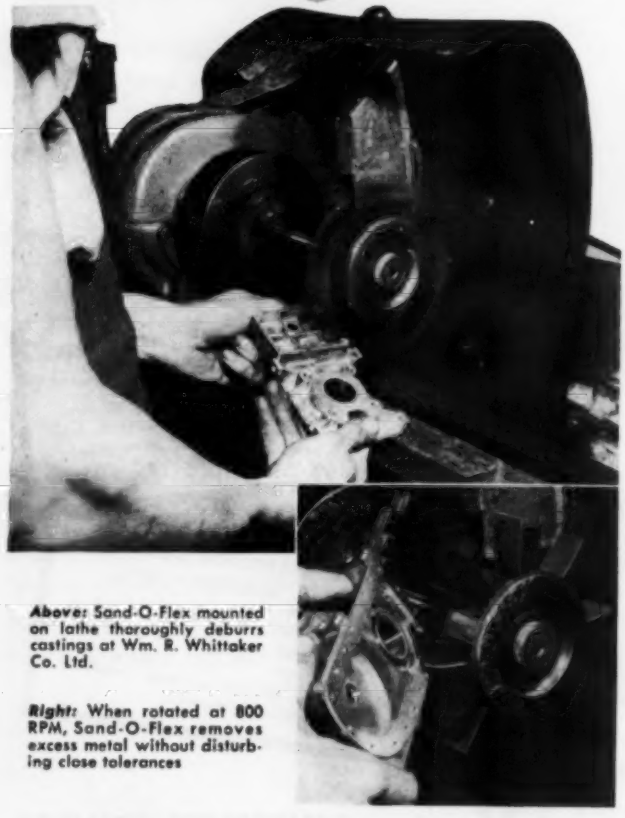
Write today for 6 page descriptive folder and prices.

ROYAL MASTER INC. 200 STATE HIGHWAY 23 RIVERDALE, N. J.

Encircle No. 278 on postpaid card

No other sander but SAND-O-FLEX can do this deburring job

Here Sand-O-Flex is solving one of the toughest sanding and deburring problems in the entire metalworking industry—removing burrs and slivers from intricate light metal castings without gouging the metal, chamfering straight edges or affecting close tolerances. These aluminum fuel slide valve housings for aircraft are thoroughly deburred in a matter of seconds at Wm. R. Whittaker Co., Los Angeles. Sand-O-Flex gets down-in and around the intricate shapes where no other sander can reach, yet still preserves the machined surfaces necessary for perfect alignment when assembled.



Above: **Sand-O-Flex mounted on lathe thoroughly deburrs castings at Wm. R. Whittaker Co. Ltd.**

Right: **When rotated at 800 RPM, Sand-O-Flex removes excess metal without disturbing close tolerances**

As the sander spins, flexible brushes gently mold the abrasive cloth over irregular surfaces, "wiping off" excess metal. The abrasive unwinds from a cartridge inside the metal case and is fed out as needed. Abrasives are furnished in many grits for a wide variety of applications. Sand-O-Flex is an attachment—it fastens to any rotating spindle (motor, lathe, drill press, electric hand drill, etc.) —no special equipment necessary. Four models, from portable to heavy duty production line uses.

Don't guess at the tool to use in your job. See your industrial distributor. It's his business to save you money by **knowing** the tool to use.

MERIT PRODUCTS, INC.

4023 IRVING PLACE, CULVER CITY, CALIF.

Encircle No. 279 on postpaid card

INDEX TO ADVERTISERS AND PRODUCTS

Abrasive Machine Tool Company (Grinding Machines) 42, 43
Creamer-Trowbridge Company
Abrasive Products Company (Abrasive Scrap) 111
Abrasive Products, Inc. (Abrasive Products) 95
Horton-Noyes Company
Aget Manufacturing Company (Dust Collectors) 90
Beeson-Reichert, Inc.
American Emery Wheel Works (Foundry Wheels) 59
Horton, Church & Goff, Inc.
Anderson Oil Company, Inc., F. E. (Lubricants & Coolants) .. 68
Peck-Adams, Inc.
Beaver Rotary File Company (Grinding Tools) 109
Besly-Welles Corporation
(Grinding Machines & Grinding Wheels) 9-12
Glenn-Jordan-Stoetzel, Inc.
Blanchard Machine Company (Grinding Machines) 33
Henry A. Loudon Advertising, Inc.
Bryant Chucking Grinder Company (Internal Grinders) ..18, 19
Henry A. Loudon Advertising, Inc.
Buckeye Tool Corporation (Abrasive Tools) 60
Industrial Advertising Service
Bullard Company, Inc., George H. (Cut-off Wheels) 90
Ad-Service, Inc.
Carborundum Company (Grinding Wheels) 69, 70
Comstock & Company Advertising
Carroll Pressed Metal Company (Grinding Wheel Inserts) ..101
Berg-Marshall Advertising
Chicago Wheel & Manufacturing Company
(Mounted Wheels) 74
Frank C. Nahser, Inc.
Cincinnati Milling Machine Company, Cimcool Division
(Coolants & Lubricants) 21
The Ralph H. Jones Company
Cincinnati Milling Machine Company
(Grinding Machines) 2, 3
Jaap-Orr Advertising Agency
Clipper Diamond Tool Company (Diamond Tools) 107
Harry Hurst Advertising
Cortland Grinding Wheels Corporation (Grinding Wheels) .. 16
William B. Remington, Inc.
Covel Manufacturing Company (Grinding Machines) ..4th Cover
Paxson Advertising, Inc.
Craftools, Inc. (Dust Collectors) 86
Chelsea Advertising, Inc.
Crane Packing Company (Lapping Machines) 49
George Holt Agency
Crystal Lake Grinders (Grinding Machines) 117
Curtis Machine Corporation (Grinding Machines) 92
Griffith & Rowland
Dumore Company (Hand Grinders) 108
Glenn-Jordan-Stoetzel, Inc.
Econaway Manufacturing Company (Abrasive Belt Splicer) ..110
Electro-Matic Products Company (Electrical Controls) 104
Munger-Spens Advertising
Electro Refractories & Abrasives Corp. (Snagging Wheels) .. 14
Tyler Kay Company
Elgin National Watch Company (Diamonds) 92
Waldie and Briggs, Inc.
Engelberg Huller Company (Grinding Machines) 80, 81
Barlow Advertising, Inc.
Erickson Tool Company, Inc. (Expanding Mandrels) 82
Palm & Patterson, Inc.
Esbec Barrel Finishing Corp. (Tumbling Barrels) 110
P S Advertising, Inc.
Ex-Cell-O Corporation (Precision Spindles) 41
Holden, Chapin, Larue, Inc.
Federal Products Corporation (Continuous Grinding Gage) .. 5
Horton, Church & Goff Company
Field Company, Inc., William H. (Cutter Grinder) 101
Randolph Associates
Gallmeyer & Livingston (Grinding Machines) 118
Van Stee, Schmidt and Sefton
General Industrial Diamond Company (Diamond Tools) 106
Grinding and Polishing Machinery Corporation
(Belt Grinding Units) 92
Saas and Sogard, Inc.
Hanchett Magna-Lock Corporation (Magnetic Chucks) 89
Paxson Advertising, Inc.
Hanchett Manufacturing Company (Knife Grinders) 86
Jaqua Advertising Company
Harig Manufacturing Company (Grinding Fixtures) 63
Conner Associates
Hartford Steel Ball Company (Tumbling Barrels) 84
The F. E. Prelle Company
Haskins Company, R. G. (Air Turbine Grinders) 66
Lester L. Jacobs, Inc.

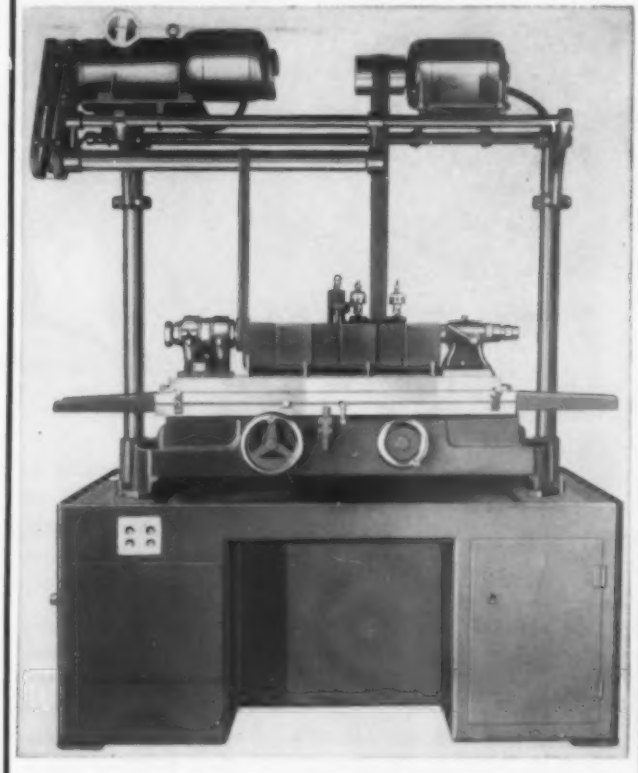
Hill Acme Company (Grinding &-Polishing Machines) 22
Osborn Bartlett and Associates
Industrial Filtration Company (Industrial Filters) 62
Drennan W. Hart Company
Industrial Gauges Corp., Electro-Autosizing Machine Div. (Electro-Autosizing Machines) 96
Raymond-Nicholas
International Chemical Company (Coolants & Lubricants) .. 97
Renner Advertisers
J & S Tool Company (Wheel Dressers) 114
Gordon A. Pihl & Associates
Johnson Company, S. C. (Coolants & Lubricants) 6, 7
Needham, Louis and Broby, Inc.
K. C. Abrasive Company (Aluminum Oxide Flours) 90
Kimball Safety Products Company (Safety Glasses) 110
Osborn Bartlett Agency
Lassy Tool Company (V-Block Angle Plates) 106
R. H. Young & Associates
Macklin Company (Grinding Wheel Segments) 20
Rumsey & Associates
Merit Products, Inc. (Sanding & Deburring Machines) 16
Dozier Eastman & Company
Micrometrical Manufacturing Company (Surface Tracers) ...98
Carl Connable Advertising
Morrison Products, Inc. (Wheel Guards) 84
Baker & Baker & Associates, Inc.
Nord Corporation (Reciprocating Hand Tools) 110
Advent Associates, Inc.
Norton Company (Grinding Wheels) 34, 35
James Thomas Chirurg Company
Nu-Matic Grinders, Inc. (Grinding Wheels) 94
The Dwight Miller Company
Peninsular Grinding Wheel (Grinding Wheels) .....3rd Cover
Central Advertising Agency
Pope Machinery Corporation (Precision Spindles) 56
Walter B. Snow & Staff, Inc.
Precision Grinding Wheel Company (Grinding Wheels) 84
Production Machine Company (Grinding Machines) 87
Charles Palm Company
Ready Tool Company (Grinder Centers) 100
Bass and Company
Reid Brothers Company, Inc. (Surface Grinders) 13
Tippett & Company, Inc.
Rivett Lathe & Grinder, Inc. (Grinding Machines) 4
Jones & Taylor and Associates
Robbins Company, Omer E. (Angular Tools & Equipment) .. 103
Gray & Kilgore, Inc.
Rocheleau Tool & Die Company, L. A. (Grinding Fixtures) ..102
Berg-Marshall, Inc.
Rothfuss Tool Company (Radius Dressers & Tool Holders) .. 86
Potter-Repak Advertising
Roto-Finish Company (Finishing Equipment) 112
Jaqua Advertising Company
Royal Master, Inc. (Centerless Grinders) 115
S. M. Ferrer
Sanford Manufacturing Company (Bench Surface Grinders) .. 99
Advent Associates
Simonds Abrasive Company (Grinding Wheels) 44
Fox & Mackenzie Advertising
Simonds Worden White Company (Grinding Wheels) 107
Ralph E. Cooper Company
Smit and Sons, Inc., J. K. (Diamond Wheels) 109
Reid, Decker and Stocki, Inc.
Speed-D-Burr Corporation (Barrel Finishing Equipment) 90
Harry G. Willis & Associates
Standard Electrical Tool Company (Snagging Grinder) 105
Dinerman and Company, Inc.
Starlight Industries (Diamond Hand Files) 110
Ernest William Greenfield, Inc.
Stuart Oil Company, Ltd., D. A. (Coolants & Lubricants) 65
Russell T. Gray, Inc.
Sunnen Products Company (Honing Machines) 64
H. George Bloch Advertising Company
Taft-Peirce Manufacturing Company (Magnetic Chucks) 8
Sutherland Abbott
Texas Company, The (Coolants & Lubricants) .....2nd Cover
Ervin, Wasey & Company, Inc.
Thompson Grinder Company (Grinding Machines) 50
Emerson H. Mook, Inc.
United States Diamond Wheel Company (Diamond Wheels) 59
Vulcan Tool Company (Rotary Tables) 36
Chester C. Moreland Company
Walker Company, O. S. (Magnetic Chucks) 93
John W. Odlin Company, Inc.
Walls Sales Corporation (Belt Sanders) 108
The Powerad Company
White & Bagley Company (Lubricants & Coolants) 67
John C. Dowd, Inc.

WHY AN OVERHEAD DRIVE?

When purchasing a Grinder you want roundness from .000005 to .000020, a finish from One to Five R.M.S with immediate spark-out for fast production and ability to hold size from .0001 to .000010.

In order to accomplish this CRYSTAL LAKE uses double taper cone bearings that are pulled into solid bronze boxes.

CRYSTAL LAKE introduced their One R.M.S Grinder in 1936 featuring their separate motor drive, eliminating cine-wave and providing ample power as a motor larger than wheel head can be used. To produce a One R.M.S. a heavy oil drag has to be placed on bearings. When a spindle is round and held tight in solid boxes, sizing is easy. Spindle, if necessary, can be stopped for measuring of small work, as motor recoil is taken up by springs on hinged motor plate.



As an example of the advantages of the overhead drive, we use our No. 1018 Universal Grinder which is equipped with a 2 horse power motor mounted overhead driving the wheel head spindle ninety degrees from grinding wheel pressure which keeps the bearings round and doubles their life. A one horse power drag is placed on a 2⅛" Diameter spindle so wheel will have to cut round. Bearings can be adjusted from time to time by using Dial Indicator to set end play.

Along with the two horse power on the Wheel Spindle a ¾ h.p. Speedranger is used on the Headstock so a ½ h.p. drag can be placed on double taper headstock bearings. Headstock will grind round from .000005" up.

Table can be moved easily as several hundred pounds are taken off table by this mounting.

Write for literature

CRYSTAL LAKE GRINDERS

Since 1910

CRYSTAL LAKE, ILLINOIS

Encircle No. 280 on postpaid card

FOUND WHERE FINE BUSINESS MACHINES ARE "BORN"

GRAND RAPIDS GRINDERS

INTERNATIONAL BUSINESS MACHINES

SMITH-CORONA

COMPTOMETER

REMINGTON RAND

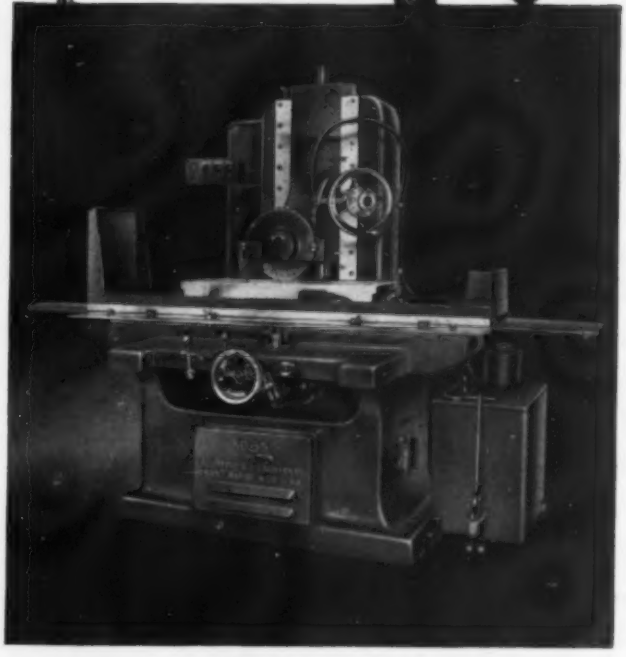
UNDERWOOD

R. C. ALLEN

Producing an intricate business machine requires exceptional toolroom precision. That's why these manufacturers use Grand Rapids Grinders . . . engineered to achieve extraordinary grinding precision at cost-cutting speed.

Model No. 55, at right, offers such features as one-piece column and base for permanent, vibrationless alignment, wheel head with powered rapid vertical travel, hydraulically actuated cross feed and longitudinal travel table. And it's the fastest grinder of its size and type, with a variable table speed up to 125 fpm!

Whether you make business machines or bulldozers, you can count on Grand Rapids Grinders for maximum toolroom precision.



GALLMEYER & LIVINGSTON

GRAND RAPIDS NO. 55 HYDRAULIC FEED SURFACE GRINDER. Table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head is 18". Preloaded ball bearing spindle greased for life. Spindle speeds 1925 and 2500 rpm.

A note on your letterhead will bring complete details.

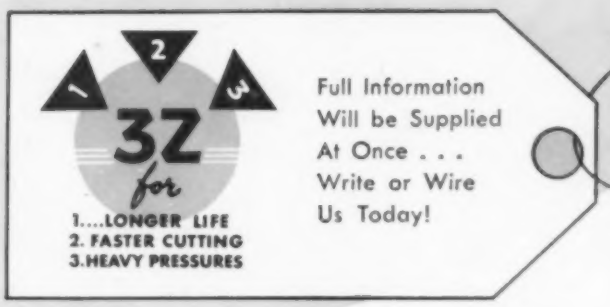
GALLMEYER & LIVINGSTON COMPANY

416 Straight Ave., S.W., Grand Rapids, Michigan

Encircle No. 281 on postpaid card

PENINSULAR ANNOUNCES ITS NEW "3Z" WHEEL

FIVE YEARS RESEARCH CREATES NEW STANDARDS FOR SLAB, BILLET AND HEAVY DUTY GRINDING



Peninsular's "3Z" Grinding Wheel, just introduced, is an entirely new concept in maximum density abrasive tools. Although the New "3Z" Wheel provides the closest possible approach to zero porosity, it gives free-cutting performance—combines the economy of faster grinding action with the longer life offered by such extra-dense structure.

This New "3Z" Wheel is packed full of specially selected, tough abrasive grains. These are held in an unusual bond, developed after a five-year research program and tested for months. As a result, you can now expect much more metal removal per minute than ever before—all this from a cooler, easier-handling unit! Peninsular abrasive engineers will gladly demonstrate the New "3Z" Wheel on any of your billet and other heavy duty grinding jobs.

PENINSULAR SINCE 1895

THE PENINSULAR GRINDING WHEEL DIVISION

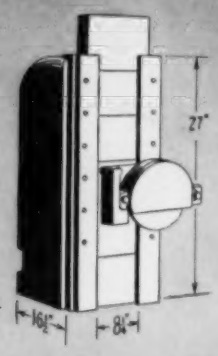
• • •

of ABRASIVE AND METAL PRODUCTS CO.

DETROIT, MICHIGAN

A&MP COMPANY

DISTRIBUTORS IN ALL PRINCIPAL CITIES

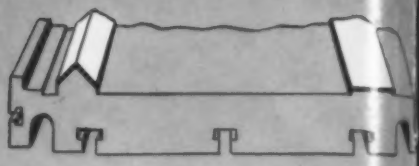


RIGID VERTICAL SLIDE

Grinding wheel and head are supported by the rigid vertical slide which is 16½" in depth. Length of vertical ways is 27". Distance between vertical ways is 8¼".

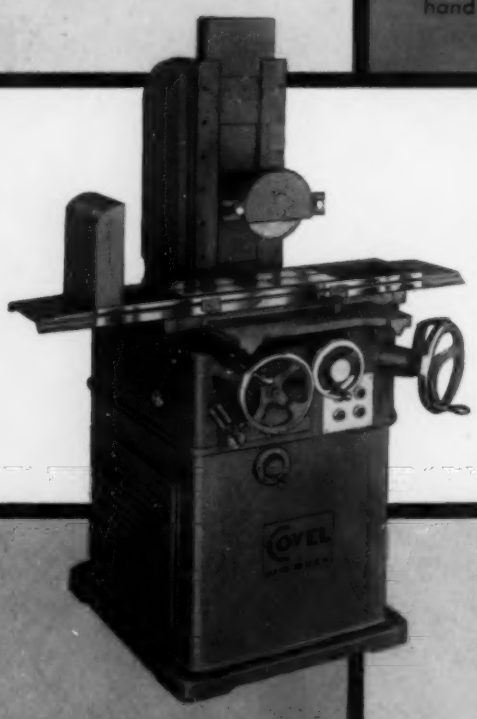
CONVENIENT CONTROLS

Elevating hand wheel with floating vernier dial pointer is handily located below table level where it doesn't interfere with operator's access to the work. Power cross feed engaged by control on front of cross feed hand wheel.



HARD CHROME TABLE WAYS

Hard chrome plating preserves the original built-in accuracy. Chrome is applied direct to alloy cast iron surface of V and flat table ways after they are precision hand-scraped.



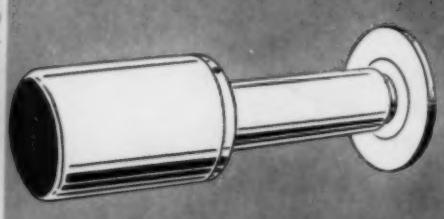
COVEL No. 10

HAND OR POWER FEED

SURFACE GRINDER

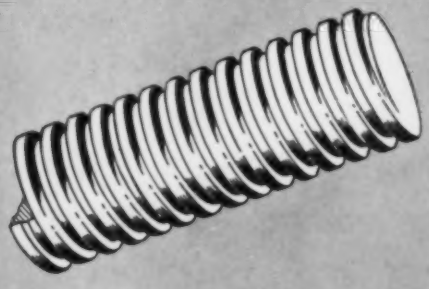
6" x 18" x 15"

Engineered to give you the most accurate gage, form tool and surface grinding performance for a low initial cost.



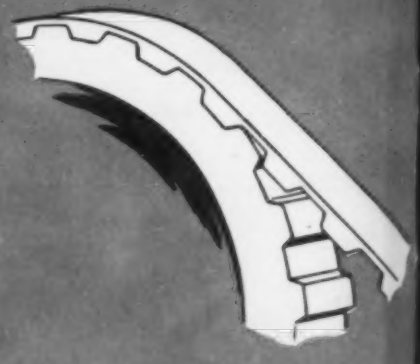
CHOICE OF SPINDLES

Covel offers your choice of Pope, Excello or Whitnon direct motor driven 1 H.P. 3450 RPM spindles. 3" diameter cartridge type. Spindle quill is supported to within 1¾" of its front end.



HARDENED AND GROUND LEAD SCREWS

Made of best quality tool steel, Covel cross feed and elevating screws are hardened and ground to insure long-lived precision operation.



SMOOTH TIMING-BELT DRIVE

Eliminates grind marks often caused by gear drives. Non-stretch positive grip toothed belt. No lubrication needed.

You'll want to know all about the rugged, low-cost No. 10, so write or 'phone today for all the details.

COVEL PRECISION GRINDERS

HYDRAULIC & HAND FEED SURFACE GRINDERS

UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS

DEPT. GF-36
BENTON HARBOR, MICHIGAN
WAlnut 6-6157